VOL. LXXXIV PART SEVEN

JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY

JULY 1959

	PAGE
The Secretary's Page	301
Notes from Wisley. By N. K. GOULD	303
Dumbarton Oaks—A Great American Garden. By LANNING ROPER. *Illustrated*	306
The Control of Variation in Garden Plants. By WATKIN WILLIAMS	317
A New Species of Paeony: *Paeonia sternjana*. By H. R. FLETCHER, F.L.S., V.M.H. *Illustrated*	326
Botany and Horticulture. By W. B. TURRILL, O.B.E., D.Sc., F.R.S., V.M.H.	328
Nut Leaf Weevil, Strophosomus, and Related Species Defoliating Japanese Azaleas. By J. M. STRINGER	332
NOTES FROM FELLOWS:	
Carbon Dioxide available for Photosynthesis. By Prof. O. V. S. HEATH	333
Gardening Saints, by F. CARDEW	335
WISLEY TRIALS IN 1958–9:	
Primroses	336
Cucumbers under Dutch Lights and Frames	336
Plants to which Awards have been made in 1958	339
Fellows wishing to obtain Plants Rare in Cultivation	342
Book Notes	343

VINCENT SQUARE, LONDON, S.W.1

Telephone: VICTORIA 4333

Don't run the risk of wood deterioration and let yourself in for the crippling cost of replacement. Use Cuprinol Wood Preservers on all woodwork to give it long lasting protection against Dry Rot and Wood-boring Insects.

★ **CUPRINOL GREEN DIP** Specially for dipping seed and bulb boxes, stakes, canes, wooden labels, etc. Supplied in 5 and 40 gallon drums.

★ **CUPRINOL GREEN · CLEAR · DARK BROWN** Use these to stop Dry Rot outbreaks and to protect against decay and woodworm. Can be varnished or polished, and Green and Clear can be painted over. *Green Cuprinol must be used for timber in contact with growing plants.*

★ **CUPRINOL HEAVY-DUTY BROWN** For protection of exterior timber only. Ideal for fences, sheds, posts, etc., which do not come in contact with plant life.

Information and advice on all preservation problems are available from The Cuprinol Preservation Centre. Please write or telephone :—

CUPRINOL LTD

DEPT. 48, TEMPERLEY HOUSE, VICTORIA, LONDON, S.W.1. Tele [illegible]

(Left): Potatoes sprayed with 'Dithane' in order to give them full protection from blight and to stimulate growth at the same time—note healthy foliage.

(Right): The ravages of potato blight—note bare stems. 'Dithane' would have prevented this, and kept the haulms green and the plants healthy.

DITHANE

Trade Mark of ROHM & HAAS Co. Philadelphia

A MAJOR ADVANCE IN PLANT DISEASE CONTROL

Dithane is one of the finest organic fungicides and is now used most extensively throughout the world. It is extremely successful as a preventative of rust, black spot on roses, peach leaf curl, blight and many other plant diseases. Dithane stimulates plant growth. It is safe to use. Unlike many other fungicides there is no risk of harmful effect on the plant.

No. 1 drum, 4/– (makes 10 gals. of spray).

SOME PLANT DISEASES CONTROLLED BY DITHANE

DISEASE	WHEN TO SPRAY
ROSE RUST	Every two to three weeks.
ROSE BLACK SPOT	Every two weeks.
PEACH LEAF CURL	Mid-February, repeat 14 days later. Autumn, at leaf fall.
APPLE SCAB	Before the flower buds open, repeat just after the petals fall and again three weeks later.
POTATO BLIGHT	When the potatoes are earthed up and at intervals of two to three weeks.
CARNATION RUST	As soon as disease threatens. Repeat every three weeks.
TOMATO LEAF MOULD	Begin in June, repeat every two weeks.
TOMATO BLIGHT	At intervals of two to three weeks throughout the summer.
CHRYSANTHEMUM RUST	Every two to three weeks.
TULIP FIRE	Every two weeks after the shoots emerge.
CELERY LEAF SPOT	Before planting out. Again at earthing up and repeat three weeks later.
ONION MILDEW	Four to six leaf stage. Repeat every three weeks.
DOWNY MILDEW of Lettuce, Cabbage and Cauliflower	As soon as disease threatens.

FROM YOUR LOCAL HORTICULTURAL SHOP

Pan Britannica Industries Ltd.
Waltham Abbey, Essex

pbi

Parker's
– the greatest name in Dutch bulbs

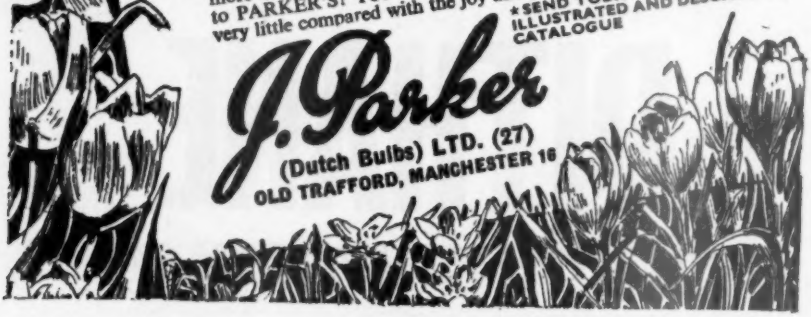
REMEMBER . . . Those gorgeous displays of Daffodils and Tulips on island sites and approaches to our cities and in our parks — those beautiful and clever colour schemes blended so harmoniously — so pleasing to the eye?

PARKER'S HAD A HAND IN THEM!

Our Parks people are very discriminate buyers. That is why more and more municipalities entrust the supply of finest quality Dutch Bulbs to PARKER'S! You too can have such a display. The cost?—so very little compared with the joy and pride you derive.

*SEND TODAY FOR OUR FULLY ILLUSTRATED AND DESCRIPTIVE CATALOGUE

J. Parker
(Dutch Bulbs) LTD. (27)
OLD TRAFFORD, MANCHESTER 16



EXCLUSIVE!

Printed for the first time ever in full colour photogravure—a printing process which captures the natural loveliness of each individual bloom—this latest edition of our catalogue tells you all you want to know about the planting and care of roses.

ABSOLUTELY FREE!

Send for your copy NOW

S. McGREDY & SON
Dept. HS.1, Royal Nurseries, Portadown, Northern Ireland

If water is your enemy

KEEP IT OUT WITH **SYLGLAS**

GLAZING AND SEALING TAPE

Weatherproofing . . . waterproofing . . . indoors or outdoors—Sylglas is the answer. Sealing, lagging, caulking — for use on windows, roofs, drainpipes, gutters, maintaining greenhouses, sheds, caravans, etc.

Sylglas for any sealing purpose — the 100% waterproof product of 30 years' experience.

30 ft. rolls 1" wide — **2/9d.**
1½" wide — **4/1½d.**

Other widths up to 4" wide in ½" steps, pro rata.

Get Sylglas from Seedsmen, Ironmongers, Builders' Merchants, etc.

If you have any waterproofing problems we shall be glad to help and give you advice.

THE SYLGLAS COMPANY

81 Knight's Hill, West Norwood, London, S.E.27

Tel: GIPsy Hill 4247 (5 lines) *Telegrams: Snowwhite, London, S.E.27*

STRAWSON

for Quality
and PERSONAL SERVICE

For 67 years, Strawson's have been building up a reputation based not only on the sheer perfection of their greenhouses but also on the *personal* service they offer to each individual client. Mr. Strawson himself arranges a Personal Survey of Inspection on request anywhere at short notice. No Strawson Greenhouse is built which has not been specially designed to suit all requirements. Horticulturists and enthusiasts throughout the country have come to praise and recommend the craftsmanship and worthiness of Strawson Greenhouses.

Write or phone
G. F. STRAWSON & SON (*Ref. B/17*)
HORLEY, SURREY Tel. 130

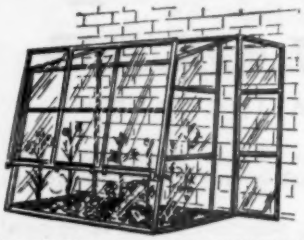
DRON-WAL *Supreme* SPRAYERS & SYRINGES

Highly suitable for all Horticultural and Greenhouse Spraying

ILLUSTRATED LISTS OF SYRINGES, SPRAYERS ETC., SENT UPON REQUEST

OBTAINABLE FROM
SEEDSMEN, IRONMONGERS AND STORES
The PHILIP B. WALDRON CO.
Kings Road, Tyseley, BIRMINGHAM, 11

Let the rain get to your plants with a "PLUIE" LEAN-TO GREENHOUSE



The roof of the unique PLUIE GREENHOUSE slides away and allows the natural rain to give your plants the essential nourishment they need. Fully assembled in about one hour, no putty is required. Size 6' 3" long, 4' 9½" wide, front 5' high, back 6' 1". A REAL BOON TO KEEN GARDENERS.

SEE US AT THE ROYAL NORFOLK SHOW—JULY 1st-2nd
ROYAL SHOW OXFORD—JULY 7th-10th
SOUTHAMPTON SHOW—JULY 10th-11th
GT. YORKSHIRE SHOW, HARROGATE—JULY 14th-16th

SEND FOR LEAFLETS
POULTMURE LTD
(Dept. RH) 6 COLLEGE ROAD, HARROW, MIDDX.

Neal's KETTERING LOAM

Supplied to Leading Horticulturists for over 30 YEARS

Finest Yellow Fibrous Kettering Loam as exhibited at the Chelsea Show. Also John Innes Composts, Bedfordshire Silver Sand and Nottingham Marl. Quotations for any quantity, delivered by Rail or Road Transport to your door, or loaded on your own lorries if you collect.

Special terms for Horticultural Societies.

KETTERING FUEL CO. LTD. (DEPT. RH)
STATION ROAD KETTERING NORTHANTS

By appointment to H.M. Queen Elizabeth II Garden Contractors and Horticultural Builders William Wood & Son Ltd.

By appointment to H.M. Queen Elizabeth the Queen Mother Garden Contractors an Horticultural Builders William Wood & Son Ltd.

JULY

July is high summer in the garden—the time of Buddleias and butterflies, when the lazy peppery smell of Phlox pervades the summer afternoon.

It could also be a time to visit some of the great gardens of this country and to study their design. For a garden, no less than any other form of art, must depend for its success upon the intrinsic quality of the design.

If you have a new garden to make or an old one to alter our design and construction service is at your disposal.

William Wood and Son Limited

TAPLOW · BUCKINGHAMSHIRE

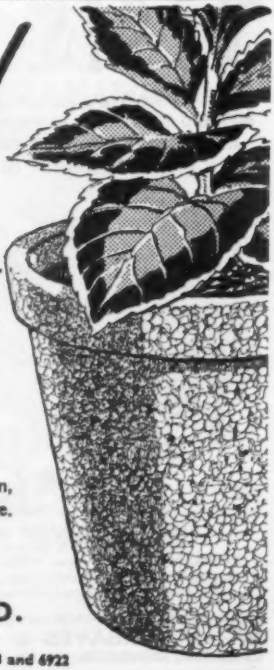
Garden Designers and Contractors

New to You!

JABLITE

Direct-planting

Flower Pots & Window Boxes



- ★ **Feather-light and unbreakable in normal use.**
- ★ **Porosity adequate for accelerated root growth.**
- ★ **Greater warmth and moisture retention (day temperature retained through night).**
- ★ **Earlier blooming . . . longer life.**
- ★ **Self-decorative and ideal for indoor use.**

JABLITE Pots are made from expanded polystyrene in Green, Yellow, Rose, Marble and Confetti in 3 in. to 9 in. size range. Window boxes are also available in the same colours.

Write for the address of your nearest stockist to :—

MOULDED COMPONENTS LTD.

(JABLO)

Jablo Works, Waddon, Croydon, Surrey **CROydon 2201/3 and 6922**

BOWLEY'S GARDEN TRUCKS

A strongly constructed well-balanced truck, specially designed for garden and nursery work, having several times the carrying capacity of a wheelbarrow yet easier to handle.

MODEL IA

PLATFORM SIZE 4 ft. by 2 ft. with 12" DETACHABLE TOP

WHEELS 12" by 2" ROLLER BEARING CUSHIONED TYRED

CARRIAGE £14 . 6 . 3 PAID

HINGED SIDE 12/6 EXTRA

S. Bowley & Son Ltd.

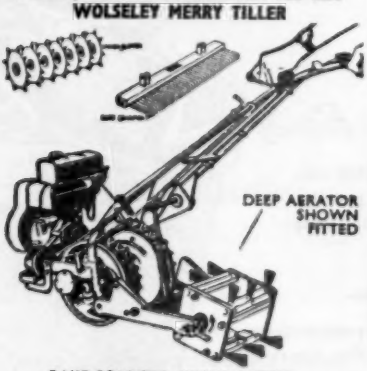
BATTERSEA BRIDGE, LONDON, S.W.11

Send for illustrated catalogue (HSJ) for complete range of sizes and models

"SISIS" — LAWNMAN TURF MANAGEMENT EQUIPMENT

For HAND use and for use with the

HOWARD ROTAVATOR BANTAM, BULLFINCH, DEMON, SHAY ROTOGARDENER 120 and WOLSELEY MERRY TILLER



RAKE SCARIFIER, SPIKER SLITTER
TURF AERATOR (illustrated)
WHALEBONE BRUSH and PRESSURE ROLLER

Quickly and easily interchanged without tools. Incorporating the Patent Resilient Control.

Full details from the Patentees and Sole Makers:

W. HARGREAVES & CO. LTD.

CHEADLE, CHESHIRE Phone GATley 4262

Feeding without forcing

A new pure-food Fertilizer which has had 3 years' research and testing is showing gardeners, nurserymen and horticulturists really remarkable results in bigger, better-formed, healthier, sturdier plants and flowers.

Quick acting, owing to its ready absorption and essential food content, LUSH Liquid Fertilizer is compounded on the following nutrient-rich analysis: Nitrogen 14%; Soluble Phosphate 9·3%; Potash 14·6%; with the trace elements Magnesium, Boron, Manganese and Iron. A 3/11d canister makes 250 gallons and LUSH is also packed in 14/6 (4-lb) and 25/- (7-lb) cartons.

Fertilize as you water with LUSH!

Completely soluble — cannot block rose

From all usual suppliers or direct from :—
LUSH-GREEN PRODUCTS LTD., May Street Works, Luton, Beds.

INTRODUCING

THE NEW AND SENSATIONAL

BIKINI

A "two-piece" Polythene Exhibition Vase for Show Blooms

Renew and Re-stock
With the following advantages over the conventional Metal Vase.

No leaking	Long life
No fading	Always looks new
No chipping	Keeps its lustre
No denting	Retains its shape
No tipping	Easy storage
No rusting	Quick packing

(Colour—mid-green)

YES! 12 WAYS BETTER—AND CHEAPER TOO

The Vase of the future, you can buy NOW

Send for a sample today. 7/6 each, plus 1/6 postage and packing.

(Quantity prices on application)

C. SALES & SON

(Horticultural Sundries)

17 HURST CLOSE, LONDON, E.4

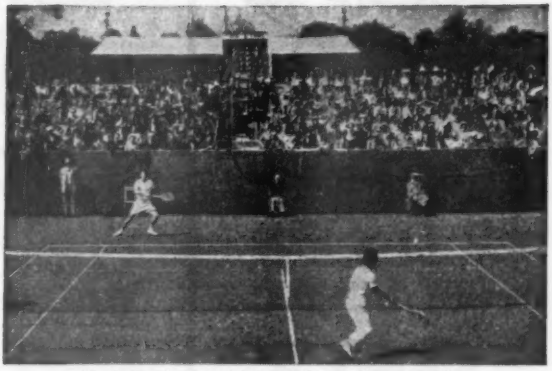
Telephone: Silverthorn 1116-7

Trade Enquiries Welcomed
Orders £5 over, Carriage Paid

EN-TOUT-CAS

HARD LAWN TENNIS COURTS

Another new En-Tout-Cas 'Everede' Court has recently been constructed at The All England Club, Wimbledon



Men's Singles, British Hard Court Championships on 'En-Tout-Cas' Court 1958

BOWLING GREENS - FOOTBALL GROUNDS - CRICKET PITCHES
RUNNING TRACKS - SWIMMING POOLS - SQUASH RACKETS COURTS

THE EN-TOUT-CAS CO., LTD.

SYSTON, LEICESTER (SYSTON 3322/7) *London Office: Harrods (4th Floor), Knightsbridge, S.W.1*

HALL'S *GUARANTEED* ANTI-ROT CEDARWOOD

SHEDS • GREENHOUSES • WORKSHOPS

Last Longer - Look Better!

NO PAINT NEEDED • MORTICED AND TENONED JOINTS FULLY SECTIONAL

SHEDS from £13.15.0

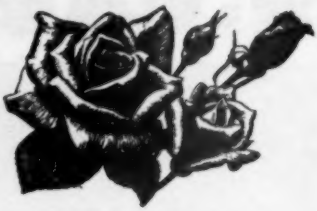
GREENHOUSES from £19.0.0

NO DEPOSIT. First payment with order and balance over 6, 12, 18 or 24 months.

FREE *Write today for Super Catalogue showing Cedarwood in full natural colours.*

FREE DELIVERY ENGLAND & WALES

R. H. HALL & CO. (KENT) LTD · 44 PADDOCK WOOD · TONBRIDGE · KENT



The best

ROSES

are fed with

CLAY'S

FERTILIZER

In cartons 1/6 and 2/3

In sealed bags 3½ lbs. 4/–, 7 lbs. 6/–, 14 lbs. 10/–, 28 lbs. 18/–, 56 lbs. 32/–, 1 cwt. 54/–

ESTABLISHED 1720

Rivers *of Sawbridgeworth*

FIRST CLASS STRAWBERRY PLANTS

Entered for Certification

ROYAL SOVEREIGN
—TALISMAN
CAMBRIDGE VIGOUR

POT PLANTS (August)

18/– per doz., p. & c. 3/–
120/– per 100, p. & c. 15/–

OPEN GROUND RUNNERS

(September–October)

8/6 per doz. plus 2/6 per order less than 100
60/– per 100, p. & c. paid

Other Varieties on application

Catalogue on request, price 6d.

THOMAS RIVERS & SON LTD
SAWBRIDGEWORTH · HERTS
TELEPHONE 2338

TAKE AND SHOW YOUR GARDEN IN COLOUR

FOR UNDER

£45

With an

AGFA Brightline SILETTE with 4 element Solinar F/2·8 lens, Compur Rapid Shutter 1–1/500th sec. £24. 14. 2

and

ALDIS 303 fan - cooled 300 W. Projector £19. 19. 0

Write, call or phone

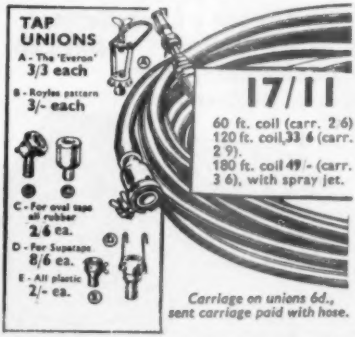
WALLACE HEATON LTD.

127 New Bond St., W.1, and Branches

Mayfair 7511

PLASTIC HOSE

The Happy Medium Plastic Hose. A quality we can recommend with confidence. Pure PVC. Will not rot, rust or corrode. Ideal for car, garden, farm. Fitted aluminium or brass spray jet nozzle.


TAP UNIONS
A - The 'Everon' 3/3 each
B - Royles pattern 3/- each
C - For oval type all rubber 2/6 ea.
D - For Superage 8/6 ea.
E - All plastic 2/- ea.
17/11
60 ft. coil (carr. 2/6)
120 ft. coil 33/6 (carr. 2/9).
180 ft. coil 49/- (carr. 3/6), with spray jet.

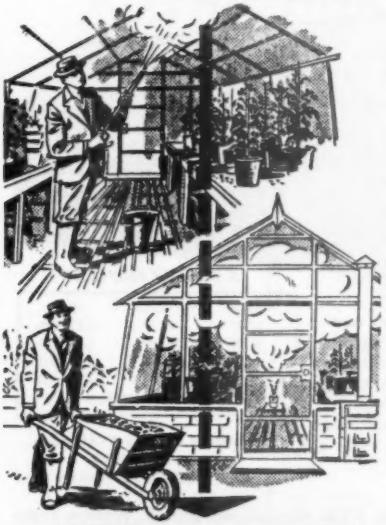
Carriage on unions 6d., sent carriage paid with hose.

Type	Bore	60 ft.	120 ft.	180 ft.
GREEN PLASTIC (with spray/jet)	½"	21/– plus 2/6 carr.	40/– plus 3/6 carr.	59/– plus 3/9 carr.
STANDARD BLACK (all perfect with spray/jet)	½"	13/6 plus 2/6 carr.	25/6 plus 2/6 carr.	37/6 plus 3/6 carr.

H. E. PHILLIPS LIMITED

King William Street, Coventry

There *is* an easier way,
Mr. Sutherland



Let **FUMITE** do the work!

With these *Smoke Pesticides* insect and fungoid pests in your greenhouse are quickly and easily controlled. In fact, treatment before planting out can *prevent* damage altogether! FUMITE is the pesticide used and recommended by professional growers everywhere.

This handy FUMITE 'Help Yourself' Unit is in your local shop now. Ask your retailer to recommend the particular smoke you need. A tube of four pellets costs between 1/6d. and 2/6d., according to type.

FUMITE

smoke pesticides

FUMITE DDT/LINDANE — FUMITE LINDANE
FUMITE TCNB — FUMITE AZOBENZENE

From seedsmen, chemists and through all branches of Boots. In case of difficulty, write to:

WAECO LTD. (Fumite Division), High Post, Salisbury, Wilts. Tel: Middle Woodford 282/3/6

new! different! unique!

Easy to fill—will not scratch sink.
Convenient to carry and beautifully balanced for pouring.
Completely enclosed to stop splashing.
Rustproof, lightweight and designed for easy storage.
Two *non-drip* roses supplied for coarse or fine spray—they clip *inside* the lid when not in use.

and doubly useful

Take off the top and it can be used as a bucket! *Graduated for measuring*, extra deep for pump or syringe spraying. Natural, with lid, etc., in choice of leaf-green or guardsman red.

49/6

EKCO *plastics*

WATERING CAN

From Departmental Stores, Hardware and Garden Shops and Ironmongers.

Please send full details of the Ekco Plastics Watering Can, Horticultural Tubes and Warm-glow Soil Heater

NAME .....

ADDRESS .....

..... JRHS.13

EKCO PLASTICS LTD

SOUTHEND-ON-SEA · ESSEX

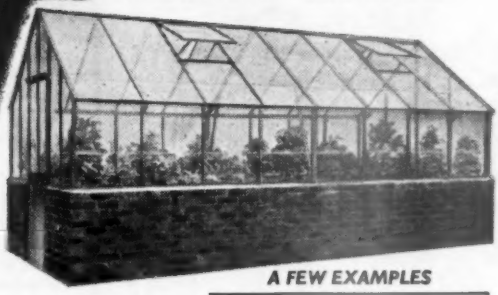
CRITTALL

"CADET"

RUSTLESS GREENHOUSES

FOR ERECTION ON

DWARF WALLS



Of special interest to those who require a larger greenhouse for pot plants, forcing and propagating purposes, are our "DW" Type Cadets. These are designed for erection on a dwarf brick wall, or any other form of solid base, and are particularly recommended where a high temperature is required. Supplied complete with glass, putty, glazing clips and foundation lugs they are easily erected from detailed instructions provided and, being rust proofed by Hot-dip Galvanizing, require no painting or maintenance. They are available in three widths and in various lengths to suit all requirements.

A FEW EXAMPLES

WIDTH	LENGTH	PRICE
6′ 3″	6′ 3″	£22.10.0.
6′ 3″	12′ 5″	£37. 0.0.
* 8′ 3″	16′ 6″	£55. 0.0.
10′ 0″	18′ 9″	£84. 5.0.

* As illustrated

DEFERRED TERMS AVAILABLE
FREE DELIVERY
ENGLAND AND WALES

Send for details to:

THE CRITTALL MANUFACTURING CO. LTD. *Horticultural Dept. C, Witham, Essex*

There's an easier way Mr. McTavish

A much easier way! The Tarpen-Strand way . . . Flexible Drive attachment and nine speedy Workheads specially designed for the job and driven by the *idle power* of most makes of motor mower, cultivator or scythe! This wonderful new source of power takes the toil out of nearly *every* task in the garden and garage!

Write now for free illustrated brochure

Use the power of your motor mower!

If you've a garden machine with engine over 30 c.c., you can drive the Tarpen-Strand Hedge Cutter; it's much easier to use and ten times faster than shears. Other Workheads, quickly interchangeable without tools, include: Rotary Grass Cutter, Hoe/Tiller, Chain Saw, Pruning Saw, etc., etc. What indeed *could* be easier or more time and money saving than:—

TARPEN-STRAND

TARPEN ENGINEERING CO. LTD., TARPEN-STRAND DIVISION,
224 Ixworth House, Ixworth Place, London, S.W.3. Tel: KENsington 3491 (7 lines)

JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY

VOL. LXXXIV PART SEVEN

July 1959

THE SECRETARY'S PAGE

ANNOUNCEMENTS—JULY AND AUGUST

Shows

WEDNESDAY, July 1 10 A.M. to 5 P.M. (Second day)	Delphinium Society's Show, in the Old Hall.
TUESDAY, July 7 12 NOON to 6 P.M. WEDNESDAY, July 8 10 A.M. to 5 P.M.	Fortnightly Flower Show and Fruit and Vegetable Competition, in the New Hall.
TUESDAY, July 14 12 NOON to 6 P.M. WEDNESDAY, July 15 10 A.M. to 5 P.M.	National Association of Flower Arrangement Societies' Festival of Floral Decoration, in both Halls.
FRIDAY, July 17 12 NOON to 7 P.M. SATURDAY, July 18 10 A.M. to 5 P.M.	British National Carnation Society's Show, in the Old Hall.
TUESDAY, July 21 12 NOON to 6 P.M. WEDNESDAY, July 22 10 A.M. to 5 P.M.	Fortnightly Flower Show, in the New Hall.
TUESDAY, August 11 12 NOON to 6 P.M. WEDNESDAY, August 12 10 A.M. to 5 P.M.	Fortnightly Flower Show, in the New Hall. Gladiolus Competition and British Fuchsia Society's Competition, in the Old Hall.

Shows—*continued*

FRIDAY, August 14 12 NOON to 6 P.M. SATURDAY, August 15 10 A.M. to 5 P.M.	British Gladiolus Society's Show, in the Old Hall.

Lectures

TUESDAY, July 21, at 3 P.M. "Mixed Borders", by MR. C. LLOYD.
TUESDAY, August 11, at 3 P.M. "Some newer Gladioli and their Cultivation", by MR. D. F. MACKAY.

Lily Conference—A four-day Conference on Lilies, Fritillaries and Nomocharis will be held from Tuesday, July 7 to Friday, July 10. It is hoped that many Fellows and Associates will find it possible to attend and take part in the Discussions. A programme giving details of the arrangements for the lectures, visits to gardens, and the Conference Dinner may be obtained on application to the Secretary.

Demonstrations at Wisley—The following demonstrations will be given at Wisley, that on the succeeding day or days being in each case a repetition of that given on the first.

July 8–9. Summer Pruning of Fruit Trees. (Commencing at 2 P.M.)

July 15–16–17. Vegetative Propagation of Shrubs and Herbaceous Plants. (Commencing at 2 P.M.)

Preventing Spray Drift Damage to Crops—Farmers, contractors and other users of selective weed-killers are reminded that costly damage can result from the drift of sprays containing compounds such as MCPA and 2,4-D on to susceptible crops. Users are urged to do everything possible to avoid spray drift during the coming season. Horticultural crops and sugar beet are specially vulnerable and extra care should be taken in the neighbourhood of glasshouses. Risks of damage can be reduced or avoided by a few simple precautions. The most important thing is to avoid spraying during windy weather, when the fine droplets of spray may be carried considerable distances and damage susceptible crops. Keeping the spraybar low helps; and high volume sprays at low pressure produce larger droplets that are less liable to drift.

Full advice and information is given in the Ministry of Agriculture's leaflet, "Spray Drift Damage to Crops", obtainable free from the Ministry's local offices, or from the Ministry (Publications), 23 Soho Square, London, W.1.

NOTES FROM WISLEY

N. K. Gould

DURING the past few months these articles have been concerned mainly with large collections and trials which combine to provide the great spring display of flowers. After mid-summer much of the interest of the Gardens lies more in individual plants, and we shall draw attention to some of the more striking ones in these notes.

We commented earlier on the damage which is sometimes done by birds to certain flowering trees and shrubs. This year, for some reason, there was no appreciable injury and, in consequence, the flowering cherries provided a more abundant show of blossom than ever before and the same can be said of the crab apples, forsythia and other plants which we have known almost to be denuded of flower in some seasons. Extremely favourable weather conditions also were, no doubt, in part responsible for the unusually fine flowering of some other shrubs, among which during May, the magnolias, shrubby paeonies, *Clematis macropetala* and *Caesalpinia japonica* were quite outstanding. Wisley now has a very good collection of varieties of *Paeonia suffruticosa*, although unfortunately, a good many are without names. The unnamed ones form part of a donation of plants by a Fellow of the Society before the war and it has not been found possible to identify them. Other shrubby ones of great interest are *P. lutea* var. *ludlowii*, a vigorous plant with great fern-like, pale green leaves and large cup-shaped, buttercup-yellow blossoms, which comes from S.E. Tibet; and *P. delavayi*, a Chinese plant also with very handsome foliage and flattish flowers of deep blood-red. Between the two species crosses have given rise to a group of very pretty hybrids varying a great deal in colour of their flowers, which are always intermediate between those of the parents. They produce seed with great freedom and this has, in the past, been distributed from Wisley on many occasions. We also have hybrids between *P. suffruticosa* and *P. lutea*, and all are worth growing.

The *Caesalpinia* mentioned above grows over the south end of the potting shed, near the glasshouses. It has stout stems covered with formidable thorns, from which in spring it sends out numerous short growths bearing elegant bipinnate pale green leaves, made up of nearly two hundred leaflets, and among these a great number of slender upright inflorescences of rounded, pale yellow flowers. This Japanese species is perhaps the least tender of a group of mostly tropical trees and shrubs, and it is well worth trying, at least in the southern counties, in a well-drained border at the foot of a sunny wall. The plant of *Clematis macropetala*, growing a few yards away on the frameyard wall, is of a superior dark coloured form and covered itself with flowers. On the same wall, at the end nearest the wild garden, *Sophora tetraptera*, the Kowhai of Chile and New Zealand, flowered this year for the first time, although now at least 12 feet high.

During July, some interesting shrubs may be expected to flower on the walls of the Laboratory. Just inside the gate on the right, there is a bush of *Philadelphus coulteri*, a tender Mexican species, which is sometimes killed almost to the ground in severe winters. Our plant has escaped injury for two or three years and should produce its large solitary cup-shaped flowers, which are deliciously fragrant. It is this uncommon species which has contributed the purple blotch to many of the most highly esteemed garden hybrids. An excellent climber growing near it is *Trachelospernum jasminoides*, the name of which relates to its white, sweetly scented, jasmine-like blossoms. In cold districts this would need a greenhouse and would hardly, perhaps, be considered worth the large amount of space which it would rapidly occupy. Two species of *Indigofera* are worth attention. Near the west wall one can see *I. hebepetala*, with bright rosy-red flowers, and on the east wall *I. pendula*, with open, branching habit, widely spaced leaves and very long slender racemes of pink flowers. The latter is very useful as it goes on flowering until very late in the summer.

Abelia schumannii is a most valuable shrub of fairly compact and bushy habit, renewing itself by a profusion of slender arching growths and providing a long succession of pink, tubular flowers until it is succeeded by *A. grandiflora*, which goes on until stopped by the frost.

The herbaceous borders will be at their best during the month. The long borders leading towards Battleston Hill, which were planted more recently than the borders in the lower part of the gardens, are now well established, and the shrubs are beginning to reach their full size, so that their true value is now apparent. They give height to the border during the winter and early part of the year, before the herbaceous plants are far advanced, and supply valuable patches of colour earlier in the season. Thus, in April and May, there were varieties of *Viburnum tomentosum* and *Diervilla* 'Abel Carrière'. At the same time the shrubby potentillas were beginning to flower, one of the earliest being the pale-coloured 'Katherine Dykes', which has a small flower of canary yellow. The ones called 'Moonlight' and 'Jackman's Variety' are more erect in habit than the last-named, and flower a little later. One of the most remarkable is a form of *P. arbuscula* collected in Nepal by MESSRS. STAINTON, SYKES AND WILLIAMS under their number 4651, and it has flowers nearly 2 inches in diameter with broad petals which match in colour the Aureolin of the Horticultural Colour Chart. Later on, the unusually large-flowered Mock Orange named 'Beauclerk' will be conspicuous as will also *Buddleia* 'White Profusion'; and towards the front of the borders there are large groups of some modern roses including the Floribunda varieties 'Honeyglow' and 'Charming Maid', and Hybrid Musks such as 'Moonlight.'

Higher up the hill the borders on either side of the broad walk into Battleston Hill will be gay with a variety of plants and shrubs, and there are a good many varieties of *Agapanthus* and *Hosta* which are decorative for several weeks, and many Hydrangeas including the popular "Lace

Caps" which have a single marginal row of sterile flowers around the inflorescence. Outstanding among these are 'Bluewave' and 'Whitewave'. Among the most valuable of late summer shrubs are the hardy fuchsias, whose arching branches carry their numerous flowers well into the autumn. Some other good things to be seen in these borders are roses 'F. J. Grootendorst' and 'Nevada,' *Euphorbia griffithii*, which has a cluster of rusty-orange bracts at the top of its leafy stem, and many beautiful hybrid lilies, mostly in orange and yellow shades.

Lilies are at the height of their beauty now, and many species and hybrids can be seen on Battleston Hill, as well as in the Wild Garden. One of the most remarkable of the hybrids is a group known as the Bellingham Hybrids which came from crosses between *Lilium humboldtii*, *L. pardalinum* and *L. parryi*. They are plants of very great vigour, and rapidly increase to form dense clumps of tall stems carrying enormous heads of orange or yellow flowers.

Although it is now rather late in the season for rhododendrons the later hybrids such as 'Amor' and 'Red Cap' help to prolong the display, and certain species such as *R. auriculatum*, represented in the wild garden by tall trees with their spreading branches heavily laden with huge fragrant white flowers, are still conspicuous. The hybrid azaleas are over now, but there are some of the species, to be seen in the collection on the top of the hill, which deserve to be much more widely planted. For example, *R. viscosum* which has white or pinkish blooms scented like honeysuckle, *R. oblongifolium* of similar character, *R. prunifolium* with apricot-orange flowers, and *R. serrulatum*, which is like *R. viscosum* and has white or purplish flowers, carrying the season into late August.

Things of interest in the other parts of the Gardens include the waterlilies in the lake in Seven Acres, the summer flowering heaths, chiefly varieties of *Erica cinerea* and *E. vagans* in the same part of the gardens; the roses on Weather Hill and the long border of annual flowers not far away. This border attracts a great deal of interest during the summer season, and it may be of interest to visitors to know that the plants in the lower section are chiefly of the half-hardy kinds, raised under glass, and planted out when weather permits, while in the larger upper section the seeds are all sown where the plants are going to flower. For convenience of thinning the seeds are sown in rows spaced a few inches apart, and those which require some support are later staked with small twiggy sticks.

DUMBARTON OAKS—
A GREAT AMERICAN GARDEN

Lanning Roper

THE gardens at Dumbarton Oaks in Georgetown, a charming residential section of Washington, D.C., are a great achievement in the creation of a large country garden in a city, brilliantly adapted to a difficult site and rich in decorative detail and planning. Dumbarton Oaks was created by the HON. and MRS. ROBERT WOODS BLISS, who served with distinction in the American diplomatic corps until retirement in 1933. In 1940 the house with its rare collections of Byzantine and Early Christian art as well as many fine pictures and sculptures of different countries and epochs was conveyed to Harvard University together with about sixteen acres of gardens surrounding it, while the remaining thirty-odd acres of the original estate was given to the government as a park for the public. MR. JOHN THACHER became the first Director, the exacting position which he still so ably holds. An endowment was provided and later a separate fund set up to assure the preservation and development of the gardens in spite of rising costs. Thus a fine American garden, revealing the very personal taste of its creator with her wide knowledge of garden design, ornament and architecture, is accessible to the vast number of visitors to the nation's capital.

The house, built in 1801 and Georgian in conception, commands a fine position on a high rise of ground. It faces south with tree-shaded lawns stretching gently down to the road which fronts it and in a long sweep to the south-east. On the east end of the house is a long, low Orangery housing a collection of ferns and tropical plants. To the east and the north the land slopes sharply. At the bottom of the valley is a charming stream, the water falling gently over the small rocky outcrops. This stream today forms part of the park as does the wooded hillside on the far side with its magnificent stand of native trees including oaks, elms, maples, beeches, sycamores and tulip trees. It is this lovely woodland of the park and of adjoining estates that provides the superb outlook from the series of terraces and overlooks which are as important to the beauty of the garden as are the noble trees, giant specimen boxwoods and flowers within it. Moreover, the sky above forms a vast backdrop and this, too, was very much in the minds of MRS. BLISS and of BEATRIX FARRAND, her landscape architect, who is considered by many to be the GERTRUDE JEKYLL of America.

I say minds, as the gardens at Dumbarton Oaks are so much a product of the happy co-operation and harmony of ideas of these two dynamic minds. Through their very close co-operation the garden evolved, each conceiving, adapting and re-evaluating her own ideas in

the light of experience and the best considered opinion of the other. MRS. BLISS knew from the start what she wanted to create, for she had definite conceptions, some of which she had treasured from childhood; others were inspired by her varied travels, for she loved to take ideas, designs and even actual details of ornament and architecture for adaptation to the peculiar needs of Dumbarton Oaks. MRS. FARRAND had taste, the "know how" and the courage of her convictions as well as unflagging energy—all important characters for such a partnership.

When MR. and MRS. BLISS purchased the house in 1922 with its fine oaks, maples and tulip trees (*Liriodendron tulipifera*) certain basic principles were laid down for MRS. FARRAND. First the gardens were to be essentially formal with strong accent on design. As Dumbarton Oaks was to be a permanent town residence there must be year-round interest with a predominance of evergreens, both coniferous and broad-leaved. These with deciduous trees and shrubs were to form the frame for the flowers which were to be carefully chosen for colour and form to enhance the scheme but which were never to dominate it. Furthermore certain sections of the garden were to be entirely green with ground covers chosen for contrasting leaf forms, colours and textures, as this charming conception of trees planted to form a high arched alley, feathery backgrounds, reflecting pools and winding paths started in childhood as an ideal dream and as the years passed it was to become an *idée fixe*. Its eventual realization is epitomized in Lover's Lane Pool with its little stepped amphitheatre, and Melisande's Alley. Because of the dramatic slope of the site it was obvious that the garden must consist of a series of broad terraces leading from the strictly formal architectural character of the house through various transitions to the delightful informality of the lower garden with its loose plantings of flowering trees, shrubs and naturalized bulbs. Full advantage was to be taken of the fine view and the sweep of sky. Lastly MRS. BLISS wished to incorporate into the garden a wealth of ornament executed in a variety of media to illustrate the wide range of decorative architectural detail and ornament available to the gardener. Much more will be said about these various precepts but these were to be the broad terms of reference laid down from the start.

As the owners were abroad a great deal of the time much of the work was done from plans and literally hundreds of sketches and mock-ups. After long consultations in 1923 on the site itself the plans for the east terraces were evolved, and during the absence of the owners a great deal of the gargantuan task of cutting out the terraces, shifting earth and the building of drainage systems and elaborate terrace walls progressed. Each time the owners returned new decisions were taken. Details of the materials and patterns for the laying of paving and the construction of walls, mock-ups of garden ornaments and wrought iron gates were endlessly set up and the process of trial and error carried on until the right solution was evolved. Often ideas were completely scrapped and new schemes evolved. Figure 102 shows such a mock-up showing the

silhouette and detail for an iron gate leading from the south side of the rose garden. All decisions were taken jointly by MRS. BLISS and MRS. FARRAND, and one can imagine the excitement of the former's return to her beloved garden after a long absence as she inspected the work already executed and the mock-ups and sketches of the next developments awaiting approval. Incidentally this utilization of mock-ups is generally employed in most gardens where ornament, gates, etc. are being selected. Only in this way can one be sure as to scale, for all too often garden ornament which seems enormous when viewed in the showroom looks dwarfed when it is moved into its chosen position in the landscape and most novices err on the side of choosing too small objects. Seldom do we see a figure or vase that is too large in a garden; yet how frequently one that is too small. The same criteria were used with planting. Stakes were made to determine the optimum height of a hedge, the scale of the huge boxwood trees on the formal terraces and the point at which the pollarded pears and willows should ultimately be stopped so as not to block the view from the house or upper terraces.

Today Dumbarton Oaks is beautiful at any time of the year. I spent a delightful morning there in early February when the ground was covered with a film of powdery fresh snow, the hollies, *Magnolia grandiflora* and the stems of the giant wistarias, the pale silver bark of *Magnolia soulangiana*, beech and silver maples standing out against the red brick of the terrace walls or the dark hedges of box, yew, hemlock (*Tsuga canadensis*) and holly. Most beautiful of all was the warm yellow green of the young trailing shoots of the heavily pollarded weeping willows on the swimming pool terrace against the vivid blue winter sky. Urns and vases were distorted in shape with snow caps and dazzling icicles. Brilliant red cardinals and many other birds plucked the fruits from shrubs and trees, for Dumbarton Oaks is a bird sanctuary as well as a pleasure garden. Even in winter there seemed to be surprisingly little bare earth, as this garden, like most other contemporary American gardens, relies heavily on carefully chosen ground covers. These include a variety of ivies, periwinkles (*Vinca major* and *minor*), honeysuckle (*Lonicera japonica*) and *Pachysandra terminalis*. So widely are these plants used that there is at first glance a certain monotony, but they have the merit of being evergreen. They are labour-saving as they keep down all weed, and they can be delightfully varied by the inclusion of mixed spring bulbs to form a primavera effect. This treatment is skilfully accomplished at Dumbarton Oaks and the results are gratifying as the garden always has a well-clothed quality in harmony with the terraces, walls, flights of steps, balustrades and garden pools.

The garden is entered by a gate on the west side where the gallery housing the Byzantine collection, an extension of the main house, opens on the street. Immediately the visitor is impressed by the broad sweep of lawns, the marginal shrubberies and the fine trees. A thick screen has been planted along the road on the south side and recently hollies

have been added to thicken the cover under the much taller deciduous trees. The use of brick, white pebbles and stone paving for paths and drives should be noted as this is so typical of the garden. In front of the main entrance, for example, the sweeping oval flanked by curved masses of box and holly is paved with stone with a simple interlace of cobbles making a bold rhythmic pattern, in keeping with the shape and picking up the brick of the house. Brick paths of interesting design lead to the house while a white pebbled drive swings in a great arc to the handsome gates.

The native trees on the south front include white, red and black oaks (*Quercus alba*, *borealis* and *velutina*), maples, English and American holly (*Ilex aquifolium* and *I. opaca*), beech and elm. Here as in other parts of the garden the lovely white dogwood (*Cornus florida*) and its pink form var. *rubra* and the red bud (*Cercis canadensis*) are features. But perhaps most impressive of all to our eyes are the magnificent specimens of *Magnolia grandiflora* which have grown into fine well-shaped trees with large glossy green leaves with cocoa brown undersides and in the warm summer months huge, heavy textured, sweetly scented flowers which nestle in a whorl of leaves like a giant ruff. The fat buds open to velvety, broad petalled flowers as much as 10–12 inches in diameter, white at first but soon turning a soft ivory. In autumn the giant seed cones split to reveal flaming orange-red seeds, borne in great profusion as the result of the hot sun-baked summer climate. There are fine specimens free-standing on the lawn and others of note against the house where they have been pruned and tied in to form flat curtains of green or great rounded buttresses in the corners where wings project on both the north fronts. The leaves would be too coarse for a small house but they are perfect in scale against this great facade. In fact, the planting of architecture should be noted as it has been skilfully and simply done using yew, evergreen privet (*Ligustrum lucidum*), *Osmanthus aquifolium*, box, *Ilex crenata*, *Pieris japonica*, and a limited number of other evergreens. Good foundation planting is characteristic of modern American homes and there are many lessons to be learned from the best of them.

Other plants of note are a particularly fine *Magnolia denudata* in front of the Orangery (Figs. 91 and 93), a giant golden rain tree (*Koelreuteria paniculata*), *Cercidiphyllum japonicum*, *Halesia carolina* and *Sophora japonica*. Tree paeonies also enjoy a prominent position near the Orangery. Two other trees should be mentioned as they are lovely to the gardens. *Paulownia tomentosa*, which forms large trees with panicles of purple foxglove-like flowers in the early spring prior to the appearance of the leaves, and the enormous *Liriodendron tulipifera*, which is one of the finest softwoods in the east. Though no particular attention has been paid to autumn colouring as this is unnecessary in the U.S., where dogwood, oaks, maples, sumacs, tulip trees and well-placed Japanese maples, as well as a host of others take on dazzling colours, Dumbarton Oaks is spectacular in the autumn as there is a high proportion of trees

which colour handsomely and the view across the valley to the wooded slopes beyond the stream is exceptional.

Let us now consider the formal layout of the garden. On the north front there is a symmetrical plan on a central axis consisting of three rectangular lawns cleverly designed on different levels and gradually narrowing to a curved delicately wrought railing which ends the vista with a drop beyond so that one looks through trees to the distant hillside and sky. The area nearest the house has a central path leading from the steps of the house to a cross path which connects with gates leading to the east to the Azalea Garden and the Beech Terrace, and on the west to a service area, cleverly concealed by masses of *Cornus florida*, *Pieris floribunda*, magnolias and flowering shrubs against a background of taller evergreens. Balustrades with carved stone pepper pot finials half close the vista and flank grass steps with brick rises which lead down to the next area. This use of grass steps is ingenious. Looking from the house the vista is entirely green, but looking back from the far end the brick rises are in harmony with the brick of the walls, gate piers and house. Two fine evergreen trees are planted behind the balustrades to frame and to narrow the vista. To the left is a 55-foot cedar of Lebanon (*Cedrus libani*), the survivor of a pair, and to the right a deodar (*Cedrus deodora*) of similar size and shape but of a greyer green. This tree replaced the mate which died. It was moved from another part of the garden in February several years ago. The moving of large trees is a common practice in the United States today and it is amazing how trees of this size and many much larger with a very wide spread can be successfully handled. The deodar has never looked back.

This rectangle of unbroken lawn terminates with walls with decorative finials which return to half close the vista. More grass steps lead down to the third much narrower lawn bordered with stone piers joined by swags of bronze chain along which wistarias have been trained. At the far end the lawn extends in a graceful ellipse flanked by seats. Along the east side a row of very old weeping cherries is beautiful in winter and summer alike because of their handsome twisted shapes. In spring, of course, they are a bower of pale pink flowers recalling the beauty of Japanese gardens at their best. There are other effects in the garden which echo the great Japanese traditions of gardening and these have been cleverly assimilated and incorporated into a garden which is first and foremost American but full of delightful foreign influences.

Returning to the Azalea Garden to the east of the main axis we find huge old plants of white azaleas (*Rhododendron indicum album*) which follow the path from the house through a delightful little garden decorated with amusing sculptures based on signs of the zodiac, down a flight of steps which divides around a baroque fountain consisting of a shell on a travertine pedestal, to the swimming pool terrace. Visitors to the garden treat this fountain as a wishing well, tossing coins into it as they descend the steps.

The pool was developed on the site of the old manure pits of the

farmyard, and the loggia and dressing-rooms are built where the cow-sheds once stood. The terrace is paved. Wistarias grow over the loggia and great wooden tubs of pale mauve azaleas (*Rhododendron mucronatum*) are used as accents. With age these have grown into fascinating shapes as have the plants at the west end behind the wall fountain with its walls and niche covered with a stalactite (rocaille) motif of carved cement and its shell fountain. Above this fountain are a pair of weeping cherry which rise from a drift of flame-coloured azaleas (*Rhododendron kaempferi*) (Fig. 99). The real beauty of the swimming pool terrace is the reflection of the willows in the blue waters or the glimpses through them to the flowering crabs and fruit trees on the slopes beyond. To the west of the pool on a much lower terrace is a tennis court. This is no longer used and the area will probably be developed as gardens for it is admirably suited with its walls as a ready-made background.

Returning to the east end of the Orangery we enter the beech terrace, so called for the great purple beech which used to dominate it. This has died and been replaced by a splendid young silver-stemmed one which is rapidly filling its allotted space. Pink marble benches and a table give human interest and scale to this terrace and there is a fine *Magnolia kobus*, its grey stems standing out boldly against the dark green background.

Steps lead from the east end of the Orangery to the Urn Terrace, named for the beautiful urn which forms its central feature. It was copied in stone from an eighteenth-century Italian terracotta which was considered too fragile for rigorous Washington winters. This urn originally stood in the centre of a formal box-edged parterre but in time the box grew beyond bounds and this scheme was replaced by a baroque pebble garden. Attractive beds of dwarf shamrock-leaved ivy outlined in brick surround the intricately shaped pebbled areas and in the centre the swag embellished column for the urn rises from further baroque patterns of Doria stone and coloured pebbles. Round the outside box-bordered beds of paeonies, columbines and irises partially screen the open work brick balustrades along which wistarias and winter jasmine are trained. The fascinating baroque scrolls and patterns are the work of the landscape architect MISS RUTH HAVEY.

A broad flight of steps leads to the Rose Terrace about 12 feet below. One side of the steps is draped with a forsythia which is planted on the top terrace and falls in a great golden curtain to the grey stone paving. It has been so carefully pruned and thinned over the years that it lies flat and smooth. Wistarias are everywhere, expertly pruned so that in spite of their age, many of them are thirty-five years old and more, they have been kept within bounds and are covered with short flowering spurs. The head gardener, MR. MATHEW KEARNEY, who has been at Dumbarton Oaks for twenty-eight years, takes great pride in the pruning of the decorative trees, shrubs and fruit and the results are a testimony to his interest and his ability to direct the staff of nine who work under him. Several summers ago MR. and MRS. BLISS took him on a tour of

many famous British gardens to acquaint him with practices abroad and as a reward for devoted service.

The Rose Garden Terrace is a much broader one with huge specimen box bushes, some of which are over 10 feet in diameter and as much in height. A central paved stone path on the axis with the steps divides the terrace into two portions of one third and two thirds respectively. To the right a cross path is flanked by two gardens of similar design with four box-edged beds of roses around a large mound of box in a square central bed with further accents at the corners of the paths. At the far end is a handsome wrought iron gate with stone pineapples on the brick piers, in contrast to the stone retaining walls. From this gate a path leads through a handsome planting of camellias, dogwoods and bamboo to Lovers' Lane Pool. To the left of the central path the design of the rose gardens is more complicated for here an enormous mound of box blocks the view, and others of comparable size form a row along the high retaining wall. The rose beds, wedge shaped and again box edged, are separated by grass paths. Roses grow superbly as the soil is heavy clay which has been generously enriched and lightened. Rose varieties include both old favourites and the new improved varieties. I noticed 'Beachblow', 'White Killarney', 'Poinsettia', 'Peace', 'Ami Quinard', 'Reveil Dijonnais', 'Mme. Grégoire Staechelin', 'Duchess of Wellington', 'Mojave', 'Confidence', etc. (Fig. 98).

From the Rose Terrace two flights of steps lead to the Fountain Terrace. In the centre on the landing between the flights is a recessed seat under a wooden and lead decorative overhang. Higher up little balconies or lookouts serve as vantage points from which to view the formal garden below with its two pools with lead figures of boys with fishes and surrounding borders of mixed herbaceous plants and bulbs. These beds are sloped up towards the walls to give the appearance of even greater depth. Here there is a feeling of openness and lawn in contrast to the intricate pattern of dark gleaming boxwood and roses on the terrace above. Stone vases have been used on the balustrades and flanking gates. There are masses of climbers including the blue berried vine (*Ampelopsis heterophylla*) and clematises such as *C. montana*, *armandii*, 'Comtesse de Bouchaud', 'Henryi' and *jackmani*. A giant beech and pollarded pear trees outside the garden at the foot of the terrace walls give a feeling of containment although the latter have been cut flat so as not to block the view and to make a setting for the Pot Garden to the north on a slightly lower level.

This Garden was developed on the site of the old herb garden which had outgrown its purpose. On the west side is a wistaria covered pergola copied from the famous designs of De Cerceau (Fig. 95). Here in its cool shadows is an unusual wall fountain with a mask, and reeds executed in lead. The Pot Garden is paved and baroque scrolls of Doria stone form a square pattern in the centre (Fig. 97). It is planned to have a sundial in the shape of a horizontal oval wheel as a central figure on ground level. *Camellia sasanqua* has been espaliered along the north wall.

Opposite the entrance from the Fountain Terrace is a little balcony with seats executed in wood and iron in contrast to the stone walls. Here one can sit under the pear blossom and look out over the sloping gardens below. These include an orchard of old apple trees underplanted with spring bulbs, double yew-backed herbaceous borders which form a strong east–west axis in the garden, two cutting gardens with stone sheds with decorative curved roof lines like elegant little gazebos, a long pergola of grapes and a variety of shrubberies and informal plantings. The pots, most of which are stored in a large cool house in winter, contain white flowered shrubs including oleanders, lemons, gardenias, camellias, azaleas, *Viburnum carlesii*. The silvery-leaved *Feijoa sellowiana* (guava) is a great favourite of MRS. BLISS's because of the dazzling silver of the underside of the leaves. This garden, which was based entirely on MRS. BLISS's own ideas, is useful as it shows the gardener, especially the city dweller, the possibilities of an entirely different type of gardening.

Descending from here we come to the herbaceous borders. The yew is cut with a peaked top because flat-topped hedges are impractical where heavy falls of snow can be expected. The borders slope markedly from west to east. The show throughout the summer and autumn is exceptional. Most of the perennials are treated as biennials as it has been found that many of them will not survive the long hot summers. This is especially true of delphiniums of the Pacific Strain. Canterbury bells, sweet williams, foxgloves, pyrethrums, potentillas, geums, heucheras and phlox are all excellent subjects. Groups of tulips make a fine show in May and these are replaced by annuals or tender plants. A border of rounded stones forms a front edge along the wide central grass path to ensure loose, free-flowering borders.

In the early autumn chrysanthemums become a feature. They are moved in by the thousands to make a dazzling display of vibrant colour. All types are used—singles, doubles, pompons, large decoratives, incurved and outcurved, and even cascades grown as standards. This display draws as many visitors as do the gardens in spring when the magnolias, forsythias, Japanese cherries and flowering crabs are at their peak.

From the cross path which bisects the herbaceous borders a north south axis planted with the unusual *Prunus blireiana* skirts the cutting gardens. These cherries have been heavily pruned to develop rather dwarf rugged trees of character with masses of flower. Originally it was planned to allow the branches to form an arch over the path but this was wisely vetoed. The large double pink flowers are particularly effective in spring.

Parallel to this axis to the west is a boxwood path which leads down from the Beech Terrace with a side path to the left under a giant elm to the terrace above the tennis court leading to the swimming pool. This long axis is paved with bricks laid in an intricate pattern of alternating diamonds and circles. It is bordered with huge box bushes (*Buxus sempervirens* var. *suffruticosa*) and taller trees including fine magnolias, hackberries (*Celtis occidentalis*) and hollies. At the bottom there is a broad fountain of unusual design formerly set in a vast ellipse of box.

This became old and overgrown and has recently been removed to make way for a new scheme involving a double line of pleached hornbeam planted to form an aerial hedge almost enclosing the ellipse with a paved path and probably ground covers or pebbled surfaces beneath.

To the west of this on the long slopes is a great massed planting of forsythia which flows down the hillside like a river of gold in spring under the silvery boles of maples (Fig. 96). The late LORD ABERCONWAY told me on several occasions that he considered this one of the finest bits of planting in America. Planted in the mid-twenties, the plants have never been renewed but carefully pruned after flowering and further thinned out in winter. There are other slopes devoted to flowering cherries and crabs, and the native dogwood is everywhere (Fig. 94).

Flowering shrubs are particularly effective in the lower part of the garden and in fact throughout the upper part as well. Particularly satisfactory are *Kolkwitzia amabilis*, philadelphus in wide variety, deutzias, flowering quinces, weigelias, exochordas and spiraeas. The crape myrtle *Lagerstroemia indica* grows into a small tree with its lovely gleaming fawn-coloured trunks like satin and its panicles of white or pink crinkled flowers. In the shrubberies to the south of the Rose Garden there is a fine specimen of the Chinese quince *Chaenomeles sinensis* with papery reddish brown bark, pale pink flowers in early spring, spectacular scarlet foliage and very large yellow fruits in autumn. This is the finest specimen I have seen. Near by is an interesting tree of weeping box from Mount Vernon.

The standard of maintenance is high and it is evident that MR. KEARNEY understands the meaning of well-kept lawns and gardens, for the whole garden reflects the high ideals which he sets for himself and his men. Dumbarton Oaks is not an easy garden to maintain. The steepness of the site and number of terraces and flights of connecting steps makes mechanization difficult. For example, the mowing in the Rose Terrace and the Fountain Terrace below requires the carrying in of the mower. Generally the turf is good and remarkably free from the great scourge of crab grass—not an easy pest. Insects and diseases are more prevalent than in this country and this required added vigilance and repeated spraying which is again time-consuming. Azaleas have to be sprayed constantly because of both whitefly and lacefly. Malathion is effective as a control. Even the English elm suffers from a fermentation of the sap which is now controlled by tapping the trees and leading off some of the sap. Caterpillars attack the fruit trees and the Japanese beetle is a difficult pest.

The large quantities of boxwood have created problems as they suffer badly from snow and ice damage as the wood of old plants is very brittle. For this reason box has to be covered with slatted shelters or burlap on a frame. Box is also subject to red spider which is controlled with Aramite, and to canker, which is controlled by lime sulphur. Occasionally, box has to be renewed. Fortunately, large plants move easily and like other broad-leaved evergreens it can be sprayed with

patented coating substances like Stopwilt or Wiltproof which stops the loss of water by transpiration. These preparations are also used as a protection against wind damage in winter.

One other area deserves particular attention. This is Lovers' Lane Pool which is built in a natural glade along the east boundary of the property, a drop of about 55 feet below the Orangery and the Beech Terrace. It is approached by a winding brick path at the upper end, where a series of semi-circular brick seats form a tiny outdoor amphitheatre around the upper part of the oval pool. The curving steps, the gentle curve of the seats and the retaining walls have a slightly baroque feeling. The remarkable subtlety of this conception, which was achieved by MRS. FARRAND, who personally supervised the actual laying of the bricks, is considered by MRS. BLISS as one of the outstanding achievements in the garden. Trees arch high overhead; banks of feathery bamboos contrast with the green of ivy and periwinkle ground covers. In spring there are myriads of early blue scillas, grape hyacinths and chionodoxas followed by the yellow of daffodils and the white of poet's narcissus. On the axis of this mirrored reflecting pool is Melisande's Alley, which follows an old cow-path. The lovely silver maples (*Acer saccharinum*) on the right are old trees but the row to the left, like so many of the large trees, were planted by the present owners in the late twenties. Today they seem incredibly large.

The garden ornaments deserve special comment. MRS. BLISS has made a particular study of this subject and wished to show the variety of media that can be used and often effectively combined. Much of the stonework was carved on the estate, just as wood was worked and lead moulded. Marble is seldom used in the garden as it is impractical in that climate. Of unusual interest are the novel lead baskets filled with carved stone fruits. The ingenuity of designs for garden benches, strategically placed throughout, is impressive. Some of these are of plain wood, teak or cypress, some are of stone while others combine wood with wrought iron or lead. The pepper-pot finials were carved from Indiana limestone, and the various fountains include travertine, lead and limestone as medias. All ornaments are carefully placed and one is impressed by both the quantity, inconspicuousness and the originality of the conception (Figs. 100, 101).

For many years MRS. BLISS has been gathering what is now an exceptional collection of books dealing with the various aspects of garden design, the history of gardens and all the allied arts of sculpture, furniture, wrought iron and garden houses. This has been brought together at Dumbarton Oaks in what is known as the Founder's Room. Grants are available for a Research Fellowship in the field of landscape gardening. One is currently held by MR. RALPH GRISWOLD, a distinguished landscape architect from Pittsburgh, who is working on an important history of gardens from the earliest times down to the eighteenth century. His grant has enabled him to travel abroad to do research and now to work undisturbed as a resident Fellow, shut off

from the outside world. MR. GRISWOLD, incidentally, was the landscape architect responsible for the planting of the Agora in Athens recently.

Also two scholarships have been awarded during the summer to post-graduate students. They work in close association with MR. KEARNEY, the head gardener, acquiring a practical knowledge of how the gardens are maintained. Visits are made to other important gardens in nearby Maryland and Virginia and the fine collection of books is at their disposal.

There is a certain amount of glass at Dumbarton Oaks. Today only pot plants are grown for the House and the Museum, but these include clivias, orchids, lilies, poinsettias, chrysanthemums, cinerarias, cyclamen and quantities of spring bulbs. There are ranges of frames for forcing azaleas and other plants and adequate space for the propagation of plants for the garden.

Recently, an advisory board of four well-recognized landscape authorities has been appointed to guide the destiny of the garden and to ensure its proper maintenance and development. They visit the gardens regularly several times a year, making recommendations for maintenance, improvement and development. MR. and MRS. BLISS have with vision realized the difficulty of trying to freeze a garden scheme. Trees and hedges have a life-span; blights, diseases and cyclones take their tolls. A body of experienced experts must advise. MRS. BLISS keeps in the closest possible touch with the garden and with this advisory group. There are certain new schemes which she hopes may in time become reality for the instruction of future gardeners. One would be a fruit garden with examples of the different types of grafted and espaliered fruit trees such as those which existed at Footscray, which so impressed MRS. BLISS on a recent visit to England that she had plans and sketches prepared to scale. Likewise at Barrington Court in Somerset she was very much struck by the wealth of variation in the patterns of the long brick path designed by MISS JEKYLL. Blue-prints of this were made and it is hoped that some of these patterns can be reproduced as a demonstration.

The gardens are open throughout the year save in August and well over a hundred thousand have availed themselves of this privilege in the last eighteen months. The preservation of Dumbarton Oaks is of particular interest as it shows how a large house with collections of libraries and art treasures and an exceptional garden has been made to fill a place in the system of a great university and thus ensure not only their preservation but their usefulness. Many other fine gardens in America are at a crossroads similar to those in our own country. Within the last few years the future of a few of these has been ensured by the foresight of the owners, who have not only endowed them so that they can be preserved but found a useful purpose for them as well so that they will continue to grow and evolve as living vital forces, integrated with modern life and changing conditions. Most important of all to my mind is the importance of preserving that curiously personal character which has resulted from the collaboration of MRS. BLISS with MRS. FARRAND and which sets Dumbarton Oaks apart from other gardens.

THE CONTROL OF VARIATION IN GARDEN PLANTS

Watkin Williams

(*John Innes Horticultural Institution, Bayfordbury, Hertford, Herts*)

(*Lecture given on March* 10, 1959, SIR FREDERICK STERN, O.B.E., M.C., F.L.S., V.M.H., *in the Chair*)

THERE are but a few people who are so "dull of soul" as to fail to acknowledge the beauty of form, of design, and of colour that resides in the flowers of the garden. Natural beauty has a universal appeal and not many can fail to be stimulated by the radiance of even the most unpretentious flower. All flowers have a certain basic loveliness that makes criticism indelicate. They never fall below the basic standard of perfection, but frequently rise to such heights so as to enable us, according to our inner selves, to recognize the exquisite from that which is merely perfect. Such is the splendour of the flower garden as it regularly and accurately unfolds its galaxy of shapes and shades, that we might pause and ask: of what is this splendour made and by what means is it determined and controlled? We can unfortunately give but a very imperfect answer to this most stimulating question.

As we search for the secrets of constancy and variation in living things, we must look for processes which are permanent yet capable of change. We have to explain why, if we plant a seed from a lily, we can with unreserved confidence expect it to grow and unfold perfect in all its details, as lilies have always unfolded, except perhaps for changes in size, form or colour. Liberal with points of detail but demanding rigid conformity to essential codes: that is the order by which living things have solved the eternal struggle for a place to exist now and through time.

The process of development and variation becomes even more intriguing when one considers that immediately after fertilization the new individual is no more than a single, microscopic cell; an embryo of one cell seemingly without even a sign of the potential stored within its controlling structures. This embryo cell, initially different but hardly distinguishable from similar cells with which it is surrounded, contains the entire code from which the structures we admire so much in living things are developed. Apart from the nourishment which it derives from the mother plant, it is self-sufficient. It controls its own destiny, absolutely and without reference. This much can be proved by excising the very small embryo from the mother plant and growing it under sterile conditions on a nutrient medium. It will develop slowly but perfectly into an individual like its parent. The fact that so much is contained in so little imposes severe limitations on the search for the

ultimate secrets within the young embryo cell. Nevertheless, there is one redeeming feature in that its very size confines our attention to essential structures when looking for a solution to the problems of continuity with change that are inherent in reproduction.

The only structure that is permanent and constant in all functioning cells is the nucleus. As its name implies it is the central or nearly central body on which all the functions of the cell are dependent. Even the nucleus, when considered as a whole, has not in all its parts the constancy required to explain why "like begets like". Certain parts of the nucleus, such as the membrane which surrounds it and the viscous fluid it contains are dispensable; they may come and go. The same is not true of the sometimes thread-like, sometimes rod-like structures, that are contained within the nuclear wall and are immersed in the nuclear fluid. These are the chromosomes * which carry faithfully from one generation to the next the code of development that the embryo will obey during its growth into a mature plant. Alterations to this code can be made only within very narrow limits. Major changes run the risk of irreparable damage very often resulting in death of the individual. Each individual species possesses a constant number of chromosomes—most forms of *Narcissus poeticus* have fourteen, while *Morus nigra* has 308. It is only in exceptional circumstances that species show any variation in their characteristic number. In most cases loss of a chromosome is fatal, while in some, gains quite frequently prove advantagea.

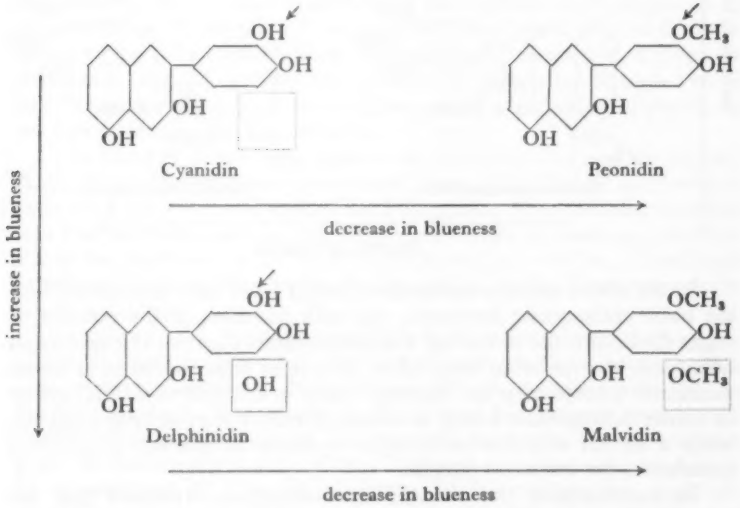
Chromosomes are separate assemblies of codes of development. The complete set characteristic of any one species is the entire code for that species, and anything less than the complete code disrupts the whole organization of development. Each individual chromosome assembly carries a certain number of the unit parts of the code, each of which is specific to a single cell process. JOHANNSEN in 1909 called these, the basic units of continuity and change in reproduction, *genes*. For most purposes we must regard individual genes as reprehensibly narrow specialists capable only of one single function. For example, one may be a code for conditioning a colour in a rose petal, and as far as is known it does little else; another may merely govern the development of the petals. It is because of this extreme specialization that none of the genes forming the exact complement for a given species is dispensable. Gene function cannot be taken over by a *locum tenens*.

Gene function may however be changed within limits, sometimes with an effect that is both advantageous to the plant and pleasant to the eye of man. The genes producing the blue colours of lupin can be changed, modified, or recombined to give the most exquisite range of colour as seen in the Russell Lupins, while the gene for petal number in the garden stock can undergo a modification that gives increased number of petals as in the double-flowered strains of *Matthiola*. But perhaps

* The word chromosome means colour body, owing to their affinity for certain colour dyes.

the most spectacular, it is certainly the best understood, gene function in plants concerns the development of petal colour in garden flowers. Many great names have been connected with the elucidation of this fascinating subject, perhaps I may be permitted to mention here only one of those—W. J. C. LAWRENCE, whose patient work on *Streptocarpus* at the John Innes revealed much of what is now known about the inheritance of flower colour variation.

The most important single group of colour producing compounds in plants belong to a group known as the Anthocyanins. They produce the scarlet, red and blue shades which predominate in garden flowers. There are three basic anthocyanins—pelargonidin, cyanidin and delphinidin. Pelargonidin named after the scarlet of *Pelargonium* is a compound producing, as one would expect, scarlet colour in the petals, while cyanidin is the basis of the red and magenta hues of roses, and delphinidin taking its name from the blue *Delphinium* conditions mauve, purple and lilac tones. These basic anthocyanins are capable of chemical modification in several different ways, thus producing shade differences in the basic colours. A little of the detail of this chemical change might be of interest to show how modification of basic colour pigments is achieved. The following diagram indicates how changes in the anthocyanin molecule brings about colour differences.

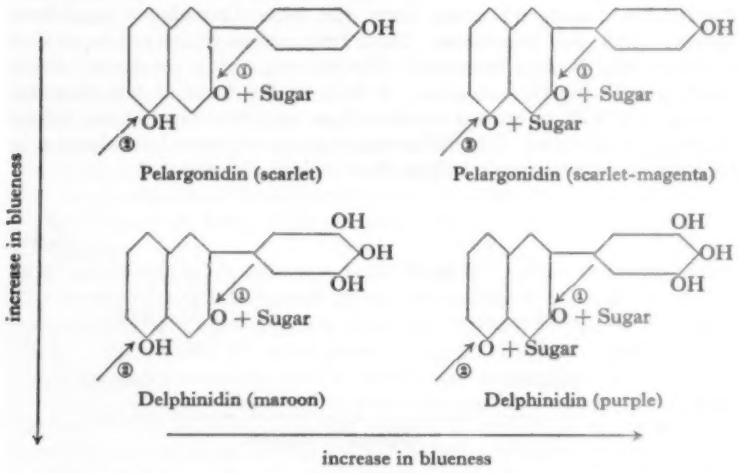


The change from cyanidin to peonidin is one which brings about a decrease in blueness of the flower, while the change from cyanidin to delphinidin increases the intensity of blue. In the transformation of cyanidin to peonidin the anthocyanin molecule is modified at the arrowed

position through a replacement of a hydrogen atom (H) by a methyl group (CH_3), and this simple chemical substitution is the basis of the difference between a dark red rose and a brighter red paeony.

Again we note that cyanidin changes to the bluer delphinidin by addition at "boxed" position of a hydroxyl group (OH). The addition or removal of hydroxyl groups is the most effective chemical way of turning on and off the intensity of blue in the petals. Delphinidin in its turn can be made less blue by substitution of a methyl group for the hydrogen atom (H) at the "boxed" and "arrowed" positions in the diagram.

Before the gene control of these chemical changes and their effect on flower colour is considered, one remaining chemical change must be introduced. This involves the addition of sugar molecules and can be diagrammatically represented as follows:



In the above scheme molecules of sugar have been introduced into the basic anthocyanin structure, and with increases in the number of sugar molecules the colour of the anthocyanin pigment changes from being less blue to being more blue. A second sugar addition at arrow position ③ by replacing the hydrogen atom in the hydroxyl (OH) group in scarlet pelargonidin brings a change of colour approaching magenta, while a similar addition at the same position in maroon delphinidin transforms the colour to purple.

In summarizing the changes in anthocyanin structure that are related to colour differences, one need only remember three simple facts: Firstly, an increase in the number of hydroxyl (OH) groups increases the blueness of anthocyanin pigment, secondly, increases in methyl groups (CH_3) pushes the colour slightly towards the red and away from blue, and, lastly, increases in the number of sugar molecules

makes for intensity of blueness. This information gives us most of the basic knowledge required to understand the manner in which genes control flower colour.

Each of the changes described in the chemical modification of anthocyanin molecules is controlled by a single gene. When a hydroxyl group becomes methylated, or a sugar molecule is attached to the structure; it is a single gene that provides the code by which this change is effected. If the gene itself be changed so as to be incapacitated, the particular function that it is there to perform will fail. If the change is not one of incapacitation but of a qualitative modification within the gene to form an altered gene structure, the function performed by the new code will also be changed.

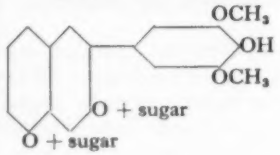
This relationship between gene and pigment can be very clearly demonstrated through the known genetic system controlling colour in *Streptocarpus*. The development of new forms of *Streptocarpus* centres mainly around two species: *S. rexii*, a blue-flowered species which was introduced into this country in 1826 and, *S. dunnii*, a red-flowered species introduced to Kew in 1884. Prior to the introduction of *dunnii* only blue-flowered *Streptocarpus* were grown here. Crosses between *dunnii* and *rexii* released a whole range of new colours ranging from ivory, through pink and magenta to mauve and blue. The genetic control of these new colours has been established by numerous careful breeding experiments and the salient features of the system can be appreciated by considering the result of crossing a salmon-coloured form of *Streptocarpus* with a blue-coloured form and studying the segregation given by the hybrid. Six colour types appear in the F_2 generation of such a cross and the nature of the pigments and the genetic constitution of the forms are represented in the next diagram.

The genes involved in the system are four in number and are lettered **A, O, R** and **D.** For a very important reason which I shall not mention each plant carries two of each of the four genes. If a particular member of a pair expresses itself in the F_1 it is described as *dominant*, whereas if it is not expressed in the F_1 hybrid it is termed *recessive*. (Dominant genes are given capital letters in the diagram (p. 322), while the recessives are in small type.)

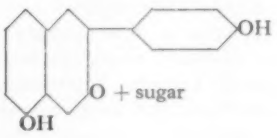
In general, the recessive condition represents a state of the gene where its prime function has been somehow impaired as lost through a change or a mutation in its structure. This is certainly true for the recessive genes for flower colour. A study of the diagram reveals that in salmon-coloured flowers of *Streptocarpus* there is only one dominant gene, the three genes **o, r** and **d** are all present in the recessive condition. In consequence of this, the structure, of the anthocyanin molecule producing salmon-coloured pigment is the simplest of the six different types given. When a dominant **R** gene is added, as in the rose-coloured flower, a new function is introduced and a methyl group (CH_3) is added. This is the only change as compared with salmon. The further introduction of the dominant **O** gene adds a second methyl group resulting

Parents

Blue (**AARROODD**)

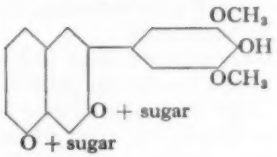


Salmon (**AArroodd**)



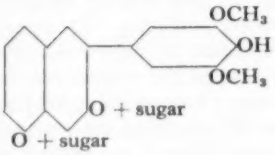
F_1 hybrid

Blue (**AARrOoDd**)

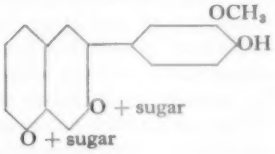


F_2 progeny (from selfing F_1 plant)

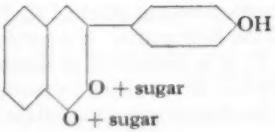
Blue (**AAOORRDD**)



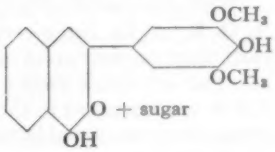
Magenta (**AAooRRDD**)



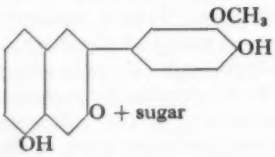
Pink (**AAoorrDD**)



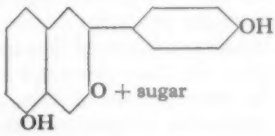
Mauve (**AAOORRdd**)



Rose (**AAooRRdd**)



Salmon (**AAoorrdd**)



in a change of colour from rose to mauve. The addition of the dominant **O** and **R** genes have transformed the simplest types of anthocyanin molecule—pelargonidin, to cyanidin and delphinidin derivatives. This

THE GARDENS AT DUMBARTON OAKS

FIG. 91—A huge tree of *Magnolia denudata* on the south front of the Orangery (see p. 309)

Photo, Fairchild Aerial Surveys, Inc.

FIG. 92—An aerial view showing the House and Orangery with the terraced gardens to the right and behind them the kitchen gardens. In the left centre is the north lawn with greenhouses beyond

FIG. 93—A close-up of *Magnolia denudata*, showing the abundance of heavy-textured flowers (see p. 309)

FIG. 94—The lower slope near the river, with masses of flowering cherries (see p. 314)

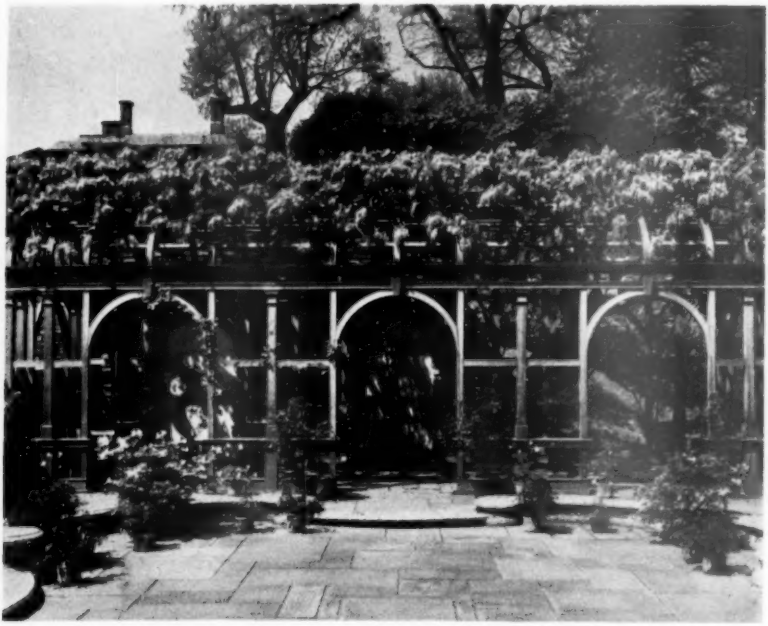


FIG. 95—A wistaria-covered arbour after the design of De Cerceau, with a wall fountain in the recently made Pot Garden (see p. 312)

FIG. 96—Luxuriant plantings of forsythias under silver maples. To the left, the stems of recently planted hornbeams wrapped with burlap for protection
(see p. 314)

FIG. 97—The paved Pot Garden enclosed with pleached pear trees on two sides
(see p. 312)

FIG. 98—The south front of the Orangery and on the right a view looking west from the Rose Garden, with specimen box a feature of both (see p. 312)

FIG. 99—A wall fountain in the shade of weeping cherries, with a central cedar, makes a dramatic picture on the Swimming Pool Terrace (see p. 311)

FIG. 100—A decorative pepper pot on the Pool Terrace and a Provençal fountain in the Bosquet, typical of the garden ornament (see p. 315)

FIG. 101—One of a pair of handsome urns with garlands and swags which frame the grass vista on the north front of the house

FIG. 102—A mock-up for a gate on the south side of the Rose Garden to show scale and design (see p 307)

FIG. 103—*Paeonia sterniana* in the Tsangpo Valley of South-East Tibet (see p. 327)

transformation is achieved through two independent, gene mediated steps. Finally, the role of the dominant **D** gene has to be considered. The pigments producing salmon, rose or mauve colours in *Streptocarpus* contain only one sugar molecule and plants having these flower colours have a recessive **d** gene. The addition of a dominant **D** gene in the pink, magenta and blue-flowered types mediates the addition of a second sugar molecule to the anthocyanin, and, as with the previous examples, this is the only function of the gene **D**.

Blue-coloured flowers are the result of all these three different functions being performed together in the same plant. When one function is omitted a colour reduced in blueness results, and when all three functions are missing the pigment produced is salmon coloured. The role of the gene **A** in the diagram has not been mentioned, and it will be noted that only the dominant form of this gene exists in the six coloured types derived from the cross. The simple explanation for this is that in the absence of **A**, no anthocyanin pigment of any kind would be produced and the flowers would be cream, ivory or white. Thus **A** is basic, to the formation even of the simplest type of anthocyanin molecule, and its presence is a prerequisite for the functioning of the other three genes.

The control of pigment development is the best-known example of the detailed control of variation in plants. It demonstrates the way in which the genes on the chromosomes act, and the kind of function genes and only genes can perform. The code of information that is borne separately by the assemblies of genes in the chromosome complement is a chemical code, and through it the whole chemical basis of development and form is established. Through the guarantee of permanence given to the chromosomes at reproduction, and the tolerance of change in the detail of the gene, the continuity of the main characteristics of species is established without imposing severe restrictions on the range of variability.

The development and deposition of anthocyanin pigments in plants are not confined to the petals. There are many highly prized decorative plants in which it is the leaves that provide the interest and beauty. Perhaps the best examples are *Poinsettia* and *Coleus*. The processes governing pigment formation in leaves are exactly the same in principle as those described in the flower of *Streptocarpus*. The formation of colour in leaves does however emphasise rather more spectacularly than do flowers, another aspect of the control of variation in plants and that is patterning. Once the ability to produce pigment has been established its distribution in various organs is then under the control of a different set of genes. These as in *Coleus* may be capable of conditioning a bewildering array of patterns with variations both in the size and nature of the pigmented area. Each change in the pattern corresponds to some slight change in the composition of the gene itself, and this is reflected either in the location of the pigment or in the area that it covers.

One of the best-known examples of the control of patterning in the

garden plants is concerned not with pigment formation but with the shape of the leaf. In *Primula sinensis* the genetics of leaf shape has been studied in great detail. There are eight genes known to be involved in the development of leaf form in this plant. These can give rise to at least 256 distinct types of leaves, each with its own shape and marginal characteristics. Of the eight genes tested, five have been known to exist in various garden varieties, while the remaining three have only been found in experimental progenies. The action of five common genes when present singly gives rise to five basic leaf types as follows:

gene	*leaf form*
f	crimp
mp	maple
t	tongue
y	fern
o	oak

All these are recessive genes and therefore they only express themselves in the absence of their dominant counterparts. When all five are present as dominants the "type" leaf of *P. sinensis* results. Combinations of more than one gene brings about a combination of more than one pattern, and since each gene in the dominant and recessive form can condition two patterns—the normal type and the altered pattern, combinations of these five can produce 32 varieties differing in leaf shape. Not all the possible combinatorial forms are known, but those already described indicate clearly the way in which the processes that are directly concerned with growth and form are under the same genetic control as the plant pigments. Shape is the result of growth and of the relative speed of growth. Rapid growth at the apex or at the bases produces an elongated or lanceolate growth form whereas differential growth rates along leaf margins will produce a deeply serrate or incised leaf. Rate of growth in its turn depends on growth-promoting chemicals, and thus the control of shape in leaves as in *Primula sinensis* can be related to the control of growth-promoting chemicals by the gene. The basic gene function therefore is the same as that seen in the anthocyanins, except that with growth processes one is witnessing gene action at stages further removed from its basic function.

In any discussion on the genetic control of variation it must almost always be understood even though a gene may not express itself in every cell, that all genes are present in all plant cells. The gene for red fruit in the tomato is present not only in the fruit but also in the green stem and in the colourless root tissues. The same is true of the flower colour and leaf shape genes described earlier. The fact that a gene is present in all cells but only expresses itself in certain tissues is a reflection of the dependence of the gene on the right environment before its particular function can be fulfilled. For example, all green leaves have genes for the production of the green pigment chlorophyll, but if kept in complete darkness, leaves that are potentially green and have genes for

chlorophyll will fail to produce chlorophyll and will develop into white or cream-coloured organs.

There are however some exceptions in which the variation we utilize to beautify our gardens is not of this type and in which the patterning achieved is not the result of the differential timing or conditioning of gene action in different organs and environments. Some varieties of plants are so constructed that not all their tissues contain exactly the same genetic factors. These contain mixtures of more than one type of tissue—each tissue type having a slightly different gene complement. Plants of this kind are described as chimaeras; of these the best known are to be found among the genera *Bouvardia*, *Pelargonium* and *Solanum*.

Although the tissues that co-exist in chimaeras may differ in respect of any genetic factor, the types most frequently encountered are those showing differences in chlorophyll development. These are expressed as variegated forms in which the margin of the leaf is white and the central part of the lamina green as in the variegated form of *Solanum capsicastrum* and of *Bougainvillea*, or else where the margin is green and the central part white, as in the *Pelargonium* 'Freak of Nature'. In types where the leaf margin is devoid of chlorophyll and the central region is green, the two types of tissue—the white and the green, are so arranged that the white or chlorophyllous layer (or layers) of cells completely surrounds a central core of green tissue. Where the leaves show the reverse patterning of variegation, the orientation of the tissue is likewise reversed. The basic genetic control of cell processes in chimaeras is no different from that in any other plant, and the fact that a certain plant is a chimaera in no way alters the action of the genes in the individual cells.

The chimaerical nature of plants may be demonstrated by separating the different tissues and thereby producing plants which are pure for one or other of the layers. Such a separation frequently happens spontaneously during the growth of the chimaera. Thus one frequently finds, on plants of the variegated *S. capsicastrum*, shoots with non-variegated, green leaves as well as shoots on which the leaves have no trace of chlorophyll. The different types of shoot result from the accidental inclusion in a bud, of cells of only one of the layers. The occurrence of three types of growth, variegated, normal green and white on one and the same plant is the sure diagnostic feature that a given variegated plant is a chimaera. It is a very rare event for a plant that is not a chimaera to show segregation into different types of growth on one and the same individual.

Apart from the accidental separation during growth of the co-existing tissues, it is possible to separate the central core region of a plant from the outer layers by taking root cuttings. It is a feature of the development of many roots, after the very first period of their development, that they cast off the outer layers of cells leaving only the inner core to form the entire cross-section of the root. The buds which form

on old established roots consist entirely of the tissue type forming the inner "core", and develop into plants which are no longer chimaeras but have the same genetic constitution in every cell. If the inner "core" is green the shoots raised from root cuttings will be green, while if the inner core is white, as in the form of *Spiraea* described by BATESON, the adventitious shoots developed on roots will be albino, and will die.

It has already been mentioned that all plant characters may be involved in chimaeras. The phenomenon is not confined to chlorophyll production and distribution. The variety 'Bridesmaid' of *Bouvardia*, which has pinkish flowers, gives rise from root cuttings to plants with red flowers resembling exactly the variety 'Hogarth'. Thus 'Bridesmaid' has a central core of tissue of the variety 'Hogarth', while in the overlying tissue the gene for red pigment has been changed to one conditioning pink colour. The typical red of 'Hogarth' has become masked by a skin of quite a different genetic constitution.

Similarly, root cuttings from the varieties 'Escot', 'Mrs. Gordon' and 'Pearl' of fancy and semi-double *Pelargoniums* are all known to give plants from root cuttings which differ in colour pattern and in the amount of crumpling of the petal when compared with the parent plant from which they were propagated. Plants raised from root cuttings of 'Mrs. Gordon' are very similar to, and are possibly identical with, the variety known as 'Cardiff', while those from 'Pearl', which is a white, semi-double, produce flowers with well-developed bands of bright pinkish red colour.

The few aspects of the control of variation that it has been possible to describe are but a very small fragment of the information that is available on this fascinating subject. They do however serve to highlight the basic control that is exercised by the smallest unit of life—the gene, on each and every aspect of vital processes. Whatever the variation, however dazzling, spectacular, or complex it may be, its determination can be traced back to micro-chemical processes emanating from the gene on the chromosome. Sometime in the near future someone may be able to answer the question: what is a gene? That is the central problem in biology today.

A NEW SPECIES OF PAEONY: *PAEONIA STERNIANA* H. R. FLETCHER

H. R. Fletcher, F.L.S., V.M.H.

ON July 21, 1938, MR. FRANK LUDLOW and DR. GEORGE TAYLOR were collecting in the Tsangpo Valley in the Kongbo Province of South-East Tibet. Near Gyala, under the dense shade of *Quercus ilex* forest, they stopped for a wayside lunch and soon realized that they were sitting on a fruiting paeony. The fruits were green and immature and although

flowers were not to be seen, the natives affirmed that these were white. Two months later, when LUDLOW and TAYLOR returned to collect mature fruits, they found that all the seeds had been shed.

Nine years later, on April 18, 1947, MR. LUDLOW and COL. H. H. ELLIOT, at a place called Tamnyen, found the plant again, just coming into flower, and a week later, April 24, they gathered beautiful flowering specimens at the spot where LUDLOW and TAYLOR had found it originally in 1938. As the natives had affirmed, the flowers were white (Fig. 103). Finally, at Tamnyen, on August 5, 1947, LUDLOW and ELLIOT collected mature indigo-blue seeds from the bright red capsules.

Although the collectors had stated in their field notes that the paeony reminded them of the beautiful white-flowered *P. emodi* Wall. of Kashmir, yet the flowering specimens (*Ludlow, Sherriff and Elliot* 13543), in spite of their white flowers, were identified with the rose-flowered *P. mairei*, a species described by LÉVÉILLE in 1915 from material collected by MAIRE at So-chan in Yunnan, but which also is present in Szechwan, where PÈRE FARGES gathered it near Tchen-Kevu-Tiu, and WILSON near Tatsienlu. However, when the white-flowered paeony became established in cultivation (raised from seeds of *Ludlow, Sherriff and Elliot* 14231) in the garden of MAJOR and MRS. KNOX FINLAY, Keillour Castle, Methven, Perth, and in the Royal Botanic Garden, Edinburgh, and probably elsewhere, and when the cultivated and wild materials were studied together, it was obvious that the Kongbo plant was neither *P. mairei* nor *P. emodi*, but was in fact a species new to science which it pleases me to name in honour of SIR FREDERICK C. STERN, who has not only monographed the genus but who for many years has successfully cultivated a great number of Paeony species and raised some splendid hybrids.

Paeonia sterniana H. R. Fletcher species nova.

Herba perennis. *Folia* plerumque biternata, segmentis anguste ellipticis vel anguste oblongo-ellipticis, acutis vel acuminatis, ad 10 cm. longis, 2 cm. latis, petiolis 4–8 cm. longis. *Caulis* florifer uniflorus, 30–90 cm. altus. *Flos* patens 6–8 cm. diametro. Sepala 4–6, extimum lanceolatum foliolatum, intimum ovatum apiculatum. *Petala* alba, obovata ad 3·5 cm. longa, 2 cm. lata. *Staminum* filamenta alba, anthera flava. *Carpella* 3–4 glabra. *Folliculi* 2·5 cm. longi, c. 1 cm. diametro, oblongo-ellipsoidei, coccinei. *Semina* indigotica.

A perennial herb with glabrous stems 30–90 cm. high. Leaves alternate, biternate, including the petiole up to 30 cm. long; leaflets glabrous deeply cut into many narrow elliptic or narrow oblong-elliptic acuminate or acute segments up to 10 cm. long and 2 cm. broad, dark green above, glaucous below. Flowers solitary up to 8 cm. across. Sepals 4, the exterior lanceolate, foliaceous, longer than the petals, the interior ovate, apiculate up to 1·5 cm. long and broad. Petals white, obovate up to 3·5 cm. long, 2 cm. broad, thin and papery. Stamens with white filaments and yellow anthers. Carpels 3–4, glabrous, pale green. Follicles scarlet when mature, 2·5 cm. long, 1 cm. broad, seed indigo-blue.

S.E. TIBET: Kongbo, Tsangpo Valley, between Tripé and Gyala, alt. 2,830 m., "Growing amongst shrubbery in stony places, like *P. emodi*, although not so

big and anthers not so golden", April 24, 1947, *Ludlow, Sherriff and Elliot* 13543 (*Holotype* in Herb. Brit. Mus., Nat. Hist.); Tamnyen, alt. 2,890 m., fruiting specimen of *L., S. & E.* 13543, but taken at Tamnyen, "This paeony matures its seeds very early, much earlier than *P. emodi* of Kashmir, which it superficially resembles", August 5, 1947 (*L., S. & E.* 14231); Gyala, alt. 2,830 m., lat. N. 29° 43′, long. E. 94° 56′, in dense shade of *Quercus ilex* forest, July 21, 1938 (*Ludlow, Sherriff and Taylor* 5350); September 26, 1938, *L., S. & T.* 5350a.

P. mairei and *P. emodi* sit comfortably in Section Paeon, subsection Foliolatae F. C. Stern. In this subsection the species are all herbaceous and the lower leaves are cut into distinct leaflets all of which are entire; *P. mascula* Miller is typical of the subsection. *P. sterniana*, on the other hand, has its leaflets very deeply lobed or toothed and is quite clearly a member of Section Paeon, subsection Dissectifoliae F. C. Stern. In this subsection its nearest of kin is *P. anomala* L., widely distributed from the Ural Mountains to Lake Baikal in Central Asia. The facies of the two species is very similar, though *P. sterniana* lacks the lines of very short hairs along the veins on the upper leaf surface, which are so characteristic of *P. anomala*. *P. veitchii* Lynch, which WILSON introduced from Szechwan for VEITCH in 1907, also is closely allied but is at once distinguished by having two or more flowers to a stem, whereas the flowers of *P. sterniana* always are solitary.

BOTANY AND HORTICULTURE

W. B. Turrill, O.B.E., D.Sc., F.R.S., V.M.H.

(*Formerly Keeper of the Herbarium and Library, Royal Botanic Gardens, Kew*)

BOTANY and horticulture are concerned with plants as material for study or for cultivation and use. They therefore overlap and there are many ways in which botanists and horticulturists can help one another. It is the purpose of this paper to record some of these and to suggest how reciprocal advantages can be improved.

Botany is the study of plants to determine what they are, the stages in their development, how and where they exist, and how they came to be as they are. Its two major divisions are morphology and physiology, that is the study of structure or "make-up" and the study of functioning or "doing", though any separation of structure and function is an artificial device of scientific convenience and can be unfortunate in its consequences if maintained too rigidly. Horticulture is the cultivation of plants in gardens as distinct from their cultivation as crops on an agricultural or forestry scale. Gardening is a combination of art, craft, and science. Art is to the fore when gardens are laid out as places of beauty and recreation, particularly in the form of flower gardens or

displays of trees and shrubs arranged for their aesthetic effects. The actual craft of growing plants depends on training and experience combined with an innate love of plants as living organisms. The scientific side of horticulture is one aspect of applied botany, with extensions into any branch of science of which the findings may bear on plant life.

Plant taxonomy, the classification of plants and all this involves, is basic to both botany in all its branches and to horticulture. Botanists of every variety and gardeners must know the kinds of plants with which they are dealing and be able to refer to them accurately and concisely. This is most conveniently done by the use of names (or occasionally for some purposes, by letter and figure symbols). Latin names are most useful at or about the level of species and for grouping these into genera, families, and higher classes. Many cultivated varieties are not known outside gardens, many hybrids are horticulturally important, the exact origin and status of many garden plants is uncertain, and large numbers of new horticultural variants are produced annually. For these, and other reasons, botanical and horticultural codes of nomenclature have been devised, more or less separately, with the underlying idea that they do not conflict. The taxonomic botanist aids the gardener in providing a definite Latin name for his species (and sometimes subspecies or variety). This is an all important starting point for, whatever else it may or may not be, the species is the basic practical unit of classification. Unfortunately, stabilization of botanical nomenclature is still only an ideal and there are some taxonomists who seem to delight in changing names that have long been in use. Occasionally, for very strong botanical reasons, this is necessary, as when increased knowledge shows that mistakes in classification have been made. The writer, however, has a great deal of sympathy with those horticulturists and others who complain about many name changes and would welcome any workable scheme for the conservation of well-known and clearly applied names, even at the expense of breaking old rules by making new ones. Rules should not be regarded as ends in themselves but as the means of giving a rational and stable nomenclature.

Naming species is not the sole, or the most interesting, work of the taxonomist and to know the correct names of his plants is only the beginning of the gardener's connections with botany. Classification, in the modern sense, involves the recognition of characters of every kind, their comparison, and their evaluation. The gardener lives with his growing plants and he can, and often does, point out to the botanist characters the latter misses, such as peculiarities of germination, habit, seasonal development, and environmental reactions. Much taxonomy is carried out in herbaria where series of dried specimens are available for comparison. Herbarium methods have a great deal to recommend them but they have their limitations, some of which can be overcome by combining herbarium work with studies in an experimental garden.

Every taxonomic, indeed every botanical, institution should be associated with a botanic garden.

A clear-cut reciprocity as between botanist and horticulturist is seen in the introduction of new plants. Botanists collect or receive collections with seeds or other propagules from far and wide, and so do horticulturists. Expeditions overseas, whether primarily botanical or horticultural, result in many species being grown in gardens that have not been in cultivation previously. Gardeners like to grow new plants and botanists should encourage them to do so by handing over seeds, etc., to them. In return, the gardener should remember that what to him is of little horticultural value, for garden beauty or for use as vegetable or fruit, may be of great interest to the botanist. A "weed" is a reproach to a gardener but is a habitat description to a botanist.

One matter of considerable importance to the botanist and for which he depends greatly on the horticulturist is the keeping of records of origin of plants grown in a garden. It is agreed that labels raise many problems and the perfect label has not yet been invented. The ideal label must include the characters of legibility, durability, cheapness and non-interference with cultural operations or the purposes of a garden. Labels, however, are essential to the gardener and are of paramount importance to the botanist. To the latter it is not the name of the species, which, indeed, it is his business to provide, but the particulars of origin of the material, who collected it, whence it came, when it was introduced, the treatment it has received since introduction, and so on, that he wants to know. Obviously, such data cannot be recorded fully on every label but should be entered in a record book against an entry number clearly given on the label.

The growing of plants can, from one point of view, be considered as a branch of experimental ecology. The relation of plants to their environment is a vast subject with many horticultural aspects. The association of plants into "plant communities" in the wild is a result of natural selection acting on the products provided by past evolution and dispersal. The gardener artificially selects what he wishes to grow, often in association, from the different kinds of plants he has "begged, borrowed, bought, or otherwise procured". The more knowlege he has of the ecology of the plants he selects the more successful may be his attempts at artificial synecology. Plants tolerate a sum total of conditions but often there are fairly definite limiting factors to their survival, or to their full flourishing, and it is one of the tasks of the gardener to discover and remove, or compensate for, such limiting factors in his attempts to give his plants the optimum sum-total conditions for existence. His success is often remarkable; he regrets but usually says nothing about his failures. The botanist can help the gardener in his practical ecology by giving information regarding the natural environmental conditions of the species. The wise gardener will divide his stock so that he grows a part under conditions that mimic, as far as possible, the natural environment as stated by the

botanist, a part under conditions that his past experience with more or less similar plants suggests might be suitable, and a part which he places just somewhere in a spare place. The results vary because the environmental factors are numerous, diverse, and are often not fully or properly known, so that, however much care be taken, there is always a large element of chance involved. Further, it is frequently impossible, under gardening conditions, to provide an exact replica of the natural environment even so far as knowledge regarding this is available. The gardener, fortunately, knows a great deal about the possibilities of compensation in supplying the needs of his plants and quite often causes them to flourish under what are unnatural conditions if these be considered one by one. To grow tropical epiphytic forest orchids in pots in a greenhouse in, for example Kew, is surely a highly developed craft.

The knowledge obtained by the gardener in growing plants, whether in association of one species with others, or as isolated specimens, is often of great value to the botanist. The gardener is concerned with the whole life-history of his plants from the seedling to the adult stages and all too often botanists, and taxonomists in particular, have not the data available for recording the structure and behaviour of seedling or juvenile states but have to limit their observations and experiments to the adult, most frequently the flowering, period. With living specimens in a garden constantly under review, and protected from interference, observations can be made at any desired times and experiments can be devised under conditions less artificial than those in the laboratory, yet under greater control than is possible "in the wild". Further, the gardener not only records characters, which the botanist may miss, he also meets with many problems which he can hand over to the botanist for solution. Some of these may be more or less academic so far as practical horticulture is concerned, while others may be immediately connected with successful cultivation. Germination of seeds, the effects of trace elements or their absence, photoperiodism, pollination, self- and cross-fertilization, causes of death, and many other matters are frequently of both botanical and horticultural importance.

Living plant material, kept easily accessible and under control, is essential for much botanical research. This is fully recognized in the New Systematics which is developing along the lines of synthetic taxonomy to include characters that can only be scored as a result of experiments. It is basic in plant breeding and it is worth recalling that the foundation of modern genetics was laid by Mendel's experiments with garden peas. Studies in plant physiology, though generally carried on in laboratories, require stocks of plants most often raised by gardeners and the cytologist "fixes" his material very frequently from plants grown in gardens, even if from seed of known wild origin.

In this short article only a few of the connections between botany and horticulture, between the botanist and the gardener, have been sketched. It is a subject worthy of much more detailed consideration

and wider extension that can be given in the space available here. The reciprocal advantages of co-operation between botanist and gardener are evident on even a preliminary consideration of their provinces, and one can say that the more a botanist knows from personal experience about gardening the better botanist will he be. It is also true that the more a gardener knows about his plants from the botanical viewpoint the better results will he obtain in cultivating them, or, at least, his interest in them will be greatly increased and he will be more and more admired by his friends and colleagues. In some ways the garden (or experimental ground) is half-way between the wild natural habitat and the laboratory or herbarium. With the restriction of natural habitats due to increasing exploitation (often synonymous with destruction so far as the botanist is concerned) by man of large areas of the earth's surface, gardens increase in importance. On the spiritual plane, one can only suggest that if dictators and politicians were mutated into botanical gardeners or gardening botanists, power politics and hydrogen bombs would become matters of historical interest only.

NUT LEAF WEEVIL, STROPHOSOMUS, AND RELATED SPECIES DEFOLIATING JAPANESE AZALEAS

J. M. Stringer

At the Imperial College Field Station, Silwood Park, Ascot, an area of dwarf azaleas is planted at the edge of a mixed beech and oak wood, with drifts of *Calluna vulgaris*, *Cytisus scoparius*, and *Rhododendron ponticum* present in the vicinity.

The varieties of Japanese azaleas in the planted area are 'John Cairns', 'Takasago', *R. ledifolium album*, 'Palestrina', *R. obtusum*, 'Kotin-shita', *R. obtusum macrostemon*.

In early May it was noted that some plants of *R. obtusum macrostemon* had damaged leaves which did not seem to have any material effect on the plant. The first week in October the plants of *R. obtusum macrostemon* and *R. obtusum* 'Kotin-shita' were found to be completely defoliated, also the stem epidermis extensively scarred; the other varieties mentioned above showed symptoms of attack. On inspection several weevils of the genus *Strophosomus* were found to be present on most plants, twenty-one being recorded on a plant of Azalea 'Palestrina' and as many as five on a single shoot. Seventy-five per cent of the weevils were identified as *S. melanogrammus* (Forster) (normal hosts—oak, hazel, birch). *S. capitatus* (Degeer) (normal hosts—oak, hazel, birch) was also found, and a third species, *S. sus* (Stephens) (normal host—*Calluna*) was present in small numbers.

FOX WILSON (1949, *The Detection and Control of Garden Pests*) records the Nut Leaf Weevil, *S. coryli* (Fab.) (= *melanogrammus*), as an occasional pest of rhododendrons in May, June and July and states that it partly skeletonizes the leaves, rarely eating out clean-cut holes. Certain features of the outbreak at Silwood Park differ from this description. The second main attack was later in the year than the normal period given by FOX WILSON, and the type of damage done was different from that which he describes. In all cases the beetles made clean-cut holes an eighth of an inch or more in diameter out of the edges of the leaves. With *R. obtusum macrostemon* and *R. obtusum* 'Kotin-shita' only the mid-rib remained. The scoring of the bark is previously unrecorded.

Complete control was obtained with one application of 25 per cent miscible D.D.T. at a concentration of 2 pints to 100 gallons.

Acknowledgments

My sincere thanks are due to DR. T. R. E. SOUTHWOOD for the identification of the insects.

NOTES FROM FELLOWS

Carbon Dioxide available for Photosynthesis

THE carbon dioxide supply which is actually *available* to the ordinary non-succulent higher plant is even more exiguous than DR. PETTERSSON states in his recent note (1). Owing presumably to the continuance in light of the respiratory production of carbon dioxide by the leaf cells, and to the escape of some of this into the intercellular spaces before it can be used in photosynthesis, the illuminated leaf never takes up the whole of the carbon dioxide, even from a restricted volume of external air. It has been found for a number of species that the minimum value to which brightly illuminated whole plants (2, 3), or detached leaves (4, 5, 6), can reduce the concentration of carbon dioxide in air is about 0·01 per cent at 77° F.; this must therefore be the minimum concentration at the surfaces of the photosynthesizing cells inside the leaf (5), and has been called gamma (Γ) for convenience (7). The greatest potential or "head" available for causing carbon dioxide to diffuse into the leaf through the stomata from ordinary external air (at 77° F.) is therefore only the difference between 0·03 per cent and about 0·01 per cent (not zero); thus only about two-thirds of the carbon dioxide is available to the plant. Some data suggest that in glasshouses the carbon dioxide concentration may fall very nearly to gamma, so that there is practically none available for photosynthesis, and the case for enriching the air with carbon dioxide in glasshouse practice is therefore even stronger than is suggested by Dr. Pettersson.

The question of whether high temperatures are beneficial or harmful, with its bearing on the possible advantageous effects of transpiration (1), is greatly complicated by the fact that Γ increases with temperature (7, 8). Thus the maximum carbon dioxide potential falls as temperature rises and this must tend to offset the gain that would otherwise result from the increase in chemical activity in the photosynthetic process. Further, a high concentration of carbon dioxide in the intercellular spaces tends to cause stomatal closure (9); the increase in Γ with temperature is therefore liable to increase indirectly the *resistance* to entry of carbon dioxide as well as directly reducing the "head". It has been found that in onion leaves there is an especially marked increase in Γ above 86° F. (7) and this is accompanied by a considerable reduction in stomatal aperture (10); it is suggested that this may account for the tendency to close at midday, shown by onion stomata (10). More recent work has shown that water-strain also affects Γ and quite mild water-strain in wheat leaves causes a marked increase in Γ, accompanied by partial stomatal closure; recovery from water-strain is followed by a fall in Γ and stomatal opening (11).

We have thus a very complex situation. A high rate of transpiration cools the leaf slightly, which should lower Γ, but is likely to result in water-strain which increases Γ, with a resulting tendency to stomatal closure and reduction in carbon dioxide uptake and transpiration. Higher temperatures increase the rates of chemical action in photosynthesis, but by increasing Γ, and sometimes causing stomatal closure, must tend to reduce carbon dioxide uptake. The resultant of these factors depends both on their levels and on the species concerned. It has been found, for instance, that *Pelargonium zonale* 'Paul Crampel' does not show the above-mentioned steep rise in Γ above 86° F. (nor has it been recorded as showing midday closure) (7). I would agree with Dr. Pettersson that the occasions when a high rate of transpiration is advantageous must be very rare and the hazards to which the ordinary higher plant is exposed in collecting its sustenance by day make the type of night life that succulents appear to have developed seem very desirable.

O. V. S. HEATH

University of Reading Horticultural
Research Laboratories,
Shinfield Grange,
Shinfield, Berkshire.

REFERENCES

(1) PETTERSSON, M. (1959): "The significance of the transpiratory loss of water from leaves", *J. R. Hort. Soc.*, **84**, 24–6.
(2) MILLER, E. S. and BURR, G. O. (1935): "Carbon dioxide balance at high light intensities", *Plant Physiol.*, **10**, 93–114.
(3) THOMAS, M. D., HENDRICKS, R. H. and HILL, G. R. (1944): "Apparent equilibrium between photosynthesis and respiration in an unrenewed atmosphere", *Plant Physiol.*, **19**, 370–6.
(4) GABRIELSEN, E. K. (1948): "Threshold value of carbon dioxide concentration in photosynthesis of foliage leaves", *Nature, Lond.*, **161**, 138.

(5) HEATH, O. V. S. (1949): "Carbon dioxide in the intercellular spaces of leaves during photosynthesis", *Nature, Lond.*, **164**, 822–3.
(6) HEATH, O. V. S. (1951): "Assimilation by green leaves with stomatal control eliminated", *Symp. Soc. exp. Biol.*, **5**, 94–114.
(7) HEATH, O. V. S., and ORCHARD, B. (1957): "Temperature effects on the minimum intercellular space carbon dioxide concentration '*Γ*'", *Nature, Lond.*, **180**, 180–1.
(8) EGLE, K and SCHENCK, W. (1953): "Der Einfluss der Temperatur auf die Lage des CO_2 Kompensationspunktes", *Planta*, 83–97.
(9) HEATH, O. V. S. and RUSSELL, J. (1954): "An investigation of the light responses of wheat stomata with the attempted elimination of control by the mesophyll". Pt. 2. "Interactions with carbon dioxide and general discussion", *Journ. exp. Bot.*, **5**, 269–92.
(10) HEATH, O. V. S. and MEIDNER, H. (1957): "Effects of carbon dioxide and temperature on stomata of *Allium cepa* L." *Nature, Lond.*, **180**, 181–2.
(11) HEATH, O. V. S. and MEIDNER, H. (1958): "Effects of water-strain on the minimum intercellular space carbon dioxide concentration *Γ* in wheat leaves", *Nature, Lond.*, **182**, 1524–5.

Gardening Saints

Why are French cabs called "fiacres"? Might I add a line to MR. ADAMS-ACTON's interesting note on St. Fiacre, in the April JOURNAL, to explain how this came about. In 1640 a Parisian called "Sauvage" decided to start a business of hiring out carriages, and for this purpose he took a house in the Rue Saint Martin. The house had formerly been used by a Brotherhood of St. Fiacre; it was still known as the Hôtel de St. Fiacre and had a figure of the saint over the door. The cab-drivers, finding a saint already in charge (so to speak), put themselves under his protection, put images of him in their cabs, and adopted him as their Patron Saint.

With regard to representations of the Saint, MISS E. S. ROHDE—in an article in *My Garden*, vol. 36 (1948), p. 66—mentions that she had seen only one, in a Book of Hours in the Bibliothèque Nationale, but she gives no more exact reference. In this, too, the Saint was holding a spade, and standing in a garden.

There were at least two other Patron Saints of Gardening—St. Phocas and St. Maurillius. St. Phocas was a gardener by Sinope on the Black Sea, and a Christian. As related by MR. SMITH in the June JOURNAL, he allowed himself to be put to death by two men to whom he had given a night's hospitality, and who had come with orders to kill St. Phocas but who did not know till the morning that their host was he. In the meantime, St. Phocas had dug his own grave. This was in A.D. 303.

St. Maurillius lived about a hundred years later. He was an Italian born at Milan but was ordained at Tours and worked under the BISHOP OF ANGERS. Later he himself was nominated Bishop of Angers. But his nerve failed him at the prospect of so much responsibility and he fled to Britain, where he took service as a gardener under a British Prince. In course of time, however, a visitor from the Continent recognized him and he was persuaded to return to Angers and take up his post. MISS ROHDE mentions that she had seen a fine representation of him in an Angers tapestry of the fifteenth century.

A rather charming imaginary conversation between the three Saints trying to determine which of them had best right to be considered *the* Patron Saint of Gardening, is to be found in the last chapter of H. L. V. FLETCHER's *By Saint Phocas* (John Gifford, 1943).

F. CARDEW

WISLEY TRIALS, 1958–9

PRIMROSES

Seven stocks of primroses were received for trial at Wisley in 1958. The trial was sown under glass on February 14, 1958, and the resulting seedlings were pricked off into seed trays on March 13, 1958. The plants were planted out into the open, where they were intended to flower, in rows 15 inches apart, spacing the plants 12 inches apart in the rows, on June 17, 1958.

The trial was inspected by a sub-committee of the Floral Committee A on April 3, 1959, and on its recommendation the Council has made the following awards to primroses.

The number in brackets after the description of the variety was that under which it was grown in the trial.

RASSE BREITENSTEIN. (Raised by Messrs. Gebr. Breitenstein, Riehen-Basel 1, Switzerland, introduced and sent by Messrs. Samen-Mauser AG., Rathausbrücke, Zurich 1, Switzerland.) **A.M.** April 3, 1959. Plant 6 to 8 inches high, 9 to 12 inches spread, vigorous, compact habit, very free-flowering; flower stems 5 to 7 inches long, slender; flowers 1½ to 1¾ inches diameter, single, very good mixture of colours including pale cream, primrose, golden yellow, crimson, purple, rosy purple, rosy lilac, blue. [7]

CHOICE MIXED. (Sent by Messrs. Watkins & Simpson Ltd., 26/29 Drury Lane, Covent Garden, London, W.C.2.) **H.C.** April 3, 1959. Plant 6 to 8 inches high, 8 to 12 inches spread, vigorous, erect and very compact habit, very free-flowering; flower stems 5 to 7 inches long, slender; flowers 1¼ to 1½ inches diameter, single, mixed colours including pale cream, primrose, salmon-rose, rosy lavender, crimson, purple, lilac. [4]

COLOURED HYBRIDS. (Raised, introduced and sent by Messrs. Dobbie & Co. Ltd., The Scottish Seed Establishment, Edinburgh, 7.) **H.C.** April 3, 1959. Plant 7 to 8 inches high, 10 to 14 inches spread, vigorous, compact habit, very free-flowering; flower stems 5 to 7 inches long, slender; flowers 1½ inches diameter, single, mixed colours including pale cream, primrose, lilac, rosy-lavender, ruby, purple, mauve. [2]

KELMSCOTT BLUE. (Raised by Mr. Edwin J. Barker, introduced and sent by Messrs. Harrison & Sons (Leicester) Ltd., St. James' Street, Leicester.) **H.C.** April 3, 1959. Plant 6 to 7 inches high, 8 to 10 inches spread, vigorous, very compact habit, very free-flowering; flower stems 4 to 5 inches long, slender; flowers 1$\frac{3}{16}$ inches diameter, single, various shades of blue including Sea Blue (H.C.C. 043/2), Bluebird Blue (H.C.C. 042), Hyacinth Blue (H.C.C. 40). [1]

CUCUMBERS UNDER DUTCH LIGHTS AND FRAMES

Forty-four stocks of cucumbers were received in 1958 for trial at Wisley. The trial was sown on May 6, 1958, and the resulting seedlings were potted on into 3-inch pots. One plant of each stock was planted under one Dutch

light and one continuous cold-frame, in order to provide comparison, on June 3, 1958. The plants were stopped to give three good breaks for cropping. No heating was used during the cultivation of the trial. Full particulars regarding the Dutch lights and continuous cold-frames are to be found in the R.H.S. JOURNAL, **82**, p. 263, and **83**, pp. 128 and 129.

The trial was inspected by a sub-committee of the Fruit and Vegetable Committee on August 21, 1958, and on its recommendation the Council has made the following awards to cucumbers as varieties suitable for cultivation under Dutch lights and frames.

The descriptions in this report are taken from the plants grown under the Dutch lights. The number in brackets after the description of the stock is that under which it was grown in the trial.

ORMSKIRKIAN. (Raised, introduced and sent by Messrs. J. L. Clucas Ltd., Ormskirk, Lancashire.) **F.C.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set freely. Fruits 13 to 16 inches long, 2 inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced eighteen fruits. [7]

ZWAAN'S ORION RESELECTED. (Raised, introduced and sent by Messrs. A. R. Zwaan & Son Ltd., Voorburg, Holland.) **F.C.C.** August 21, 1958. Plant vigorous; leaves medium to large, flat, dark green. Flowers large, set freely. Fruits 11 to 12 inches long, 2½ inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced twenty fruits. [13]

BUTCHER'S DISEASE-RESISTING IMPROVED. (Raised, introduced and sent by Messrs. Sutton & Sons Ltd., Reading, Berkshire.) **A.M.** August 21, 1958. Plant vigorous; leaves large, flat, medium to dark green. Flowers large, set fairly freely. Fruits 13 to 14 inches long, 2½ inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced thirteen fruits. [25]

CONQUEROR. (Raised, introduced and sent by Messrs. Watkins & Simpson Ltd., 26/29 Drury Lane, Covent Garden, London, W.C.2.) **A.M.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set freely. Fruits 12 to 15 inches long, 2 inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced nineteen fruits. [19]

FINAL OF HAMMENHÖG. (Raised at the Plant Breeding Station, Gullaker, Hammenhög, Sweden, introduced and sent by Messrs. Otto J. Olson & Sons A.B., Hammenhög, Sweden.) **A.M.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set very freely. Fruits 13 to 14 inches long, 2½ inches diameter, medium green, symmetrical; neck short; flesh thick. One plant produced twenty-three fruits. [35]

NUNHEM'S GREEN STANDARD. (Sent by Messrs. Nunhem Seed Co., Haelen Lb., Holland.) **A.M.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers medium size, set freely. Fruits 14 to 15 inches long, 2 inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced sixteen fruits. [12]

SLUSIA TELEX. (Raised, introduced and sent by Messrs. Abraham Sluis Ltd., Enkhuizen, Holland.) **A.M.** August 21, 1958. Plant vigorous; leaves large, flat, dark green, Flowers large, set freely. Fruits 13 to 15 inches long, 2 inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced fifteen fruits. [10]

STANDEX. (Raised by Messrs. Pannevis, Holland, introduced and sent by Messrs. Samuel Dobie & Son Ltd., 11 Grosvenor Street, Chester.) **A.M.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set freely. Fruits 12 to 13 inches long, 2 inches diameter, light to medium green, symmetrical; neck short; flesh thick. One plant produced seventeen fruits. [15]

VUREX. (Raised by Messrs. Pannevis, Holland, introduced and sent by Messrs. Samuel Dobie & Son Ltd.) **A.M.** August 21, 1958. Plant vigorous; leaves medium size, flat, dark green. Flowers medium size, set freely. Fruits 14 to 15 inches long, 2 inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced nineteen fruits. [17]

BATON. (Raised, introduced and sent by Messrs. H. J. Speed & Sons Ltd., 47/49 Port Street, Evesham, Worcestershire.) **H.C.** August 21, 1958. Plant vigorous; leaves medium size, flat, dark green. Flowers large, set freely. Fruits 12 to 14 inches long, 2½ inches diameter, medium green, symmetrical; neck short; flesh thick. One plant produced twenty-two fruits. [36]

EDNEY'S TELEGRAPH IMPROVED. (Raised, introduced and sent by Messrs. Watkins & Simpson Ltd.) **H.C.** August 21, 1958. Plant vigorous; leaves medium size, flat, dark green. Flowers large, set fairly freely. Fruits 13 to 14 inches long, 2 inches diameter, medium green, symmetrical; neck short; flesh thick. One plant produced thirteen fruits. [3]

FLAMEX. (Raised by Messrs. Pannevis, Holland, introduced and sent by Messrs. Samuel Dobie & Son Ltd.) **H.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set freely. Fruits 15 to 18 inches long, 2 inches diameter, medium green, symmetrical; neck short; flesh thick. One plant produced twenty-three fruits. [16]

GREEN STANDARD. (Raised by Mr. Hugo Groot, introduced and sent by Messrs. Jacob Jong Seed Co. Ltd., Noordscharwoude, Holland.) **H.C.** August 21, 1958. Plant vigorous; leaves very large, flat, dark green. Flowers large, set freely. Fruits 13 to 14 inches long, 1¾ inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced sixteen fruits. [11]

MARKET CROSS. (Raised, introduced and sent by Messrs. Harrison & Sons (Leicester) Ltd., St. James' Street, Leicester). **H.C.** August 21, 1958. Plant vigorous; leaves medium size, flat, dark green. Flowers large, set freely. Fruits 13 to 14 inches long, 2 inches diameter, medium green, symmetrical; neck short; flesh thick. One plant produced twenty fruits. [27]

MINERVA. (Raised, introduced and sent by Messrs. Gebr. van den Berg N.V., Naaldwijk, Holland.) **H.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set freely. Fruits 13 to 18 inches long, 2½ inches diameter, light to medium green, symmetrical; neck short; flesh thick. One plant produced twenty-four fruits. [5]

MONOPOL. (Raised, introduced and sent by Messrs. L. Daehnfeldt Ltd., 75 Vestergade, Odense, Denmark.) **H.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set fairly freely. Fruits 12 to 14 inches long, 2½ inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced fourteen fruits. [37]

NEWBURGH TRIUMPH. (Raised, introduced and sent by Messrs. J. L. Clucas Ltd.) **H.C.** August 21, 1958. Plant vigorous; leaves medium size, flat, dark green. Flowers large, set fairly freely. Fruits 14 to 15 inches long, 2½ inches diameter, light to medium green, symmetrical; neck short; flesh fairly thick. One plant produced eleven fruits. [8]

NOGUM. (Raised, introduced and sent by Messrs. A. R. Zwaan & Son Ltd.) **H.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set fairly freely. Fruits 14 to 15 inches long, 2½ inches diameter, light to medium green, symmetrical; neck short; flesh thick. One plant produced nine fruits. [9]

SHARPE'S EPICUREAN. (Raised, introduced and sent by Messrs. Charles Sharpe & Co. Ltd., Sleaford, Lincs.) **H.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set freely. Fruits 13 to 16 inches long, 2 inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced twenty-one fruits. [29]

SPIERS. (Raised and sent by Messrs. Co-op. Zaaizaadvereniging, West Friesland, W.A., Wijdenes, Holland.) **H.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers medium size, set freely. Fruits 13 to 14 inches long, 2 inches diameter, medium green, symmetrical; neck short; flesh thick. One plant produced twenty-two fruits. [33]

SUTTON'S IMPROVED TELEGRAPH. (Raised, introduced and sent by Messrs. Sutton & Sons Ltd.) **H.C.** August 21, 1958. Plant vigorous; leaves large, flat, dark green. Flowers large, set freely. Fruits 15 to 16 inches long, 2½ inches diameter, medium to dark green, symmetrical; neck short; flesh thick. One plant produced twenty-two fruits. [2]

PLANTS TO WHICH AWARDS HAVE BEEN MADE IN 1958

The Royal Horticultural Society and The National Chrysanthemum Society have made jointly the following awards to chrysanthemums after exhibition at the Shows of The Royal Horticultural Society and The National Chrysanthemum Society, on the recommendation of the Joint Chrysanthemum Committee.

EARLY-FLOWERING CHRYSANTHEMUMS

Chrysanthemum 'Dorothea' F.C.C. September 30, 1958, as a variety for show purposes. Section 21, Reflexed, large-flowered, white. Described R.H.S. JOURNAL, **83,** p. 221 (**A.M.** 1957). Raised and shown by Messrs. J. & T. Johnson, Tibshelf, Derbyshire.

Chrysanthemum 'Astra' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, large-flowered, white. Flowers 6½ inches diameter; florets long, medium width, slightly pointed, slightly quilled, white. Raised and shown by Messrs. J. & T. Johnson.

Chrysanthemum 'Bertram Watts' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, pink. Flowers 5½ inches diameter; florets short, broad, blunt, flat, Tyrian Rose (H.C.C. 24/3), inner florets flushed salmon. Raised and shown by Messrs. Greenyer Bros. Ltd., Broadwater Green Nurseries, Worthing, Sussex.

Chrysanthemum 'Bettina' A.M. September 16, 1958, as a variety for cutting for market. Section 21, Reflexed, large-flowered, pale pink. Flowers 6 inches diameter; florets long, broad, slightly pointed, slightly quilled, Rose Pink (H.C.C. 427/2). Raised and shown by Mr. Frank Rowe, Rylands Nurseries, Wellington, Somerset.

Chrysanthemum 'Brian Woolman' A.M. August 27, 1958, as a variety for show purposes and cutting for market. Section 22, Incurving, medium-flowered, light bronze. Flowers 6 inches diameter, florets long, broad, slightly pointed, channelled, a colour near Yellow Ochre (H.C.C. 07), reverse Chrome Yellow (H.C.C. 605/1). Raised and shown by Messrs. H. Woolman Ltd., Shirley, Birmingham.

Chrysanthemum 'Bronze Covent Garden' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, bronze. Flowers 5½ inches diameter; florets medium length, medium width, slightly pointed, slightly quilled, rich orange bronze. Shown by Messrs. Zwager Bros., Cheshunt Nursery, Brookfield Lane, Cheshunt, Herts.

Chrysanthemum 'Catherine Porter' A.M. September 30, 1958, as a variety for show purposes. Section 21, Reflexed, medium-flowered, pink. Flowers 5 inches diameter; florets medium length, medium width, slightly pointed, slightly quilled, Empire Rose (H.C.C. 0621/2), inner florets flushed salmon. Raised and shown by Messrs. J. & T. Johnson.

Chrysanthemum 'Christine Brooks' A.M. September 30, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, large-flowered, yellow. Flowers 6½ inches diameter; florets medium length, broad, slightly pointed, flat, Empire Yellow (H.C.C. 603). Raised and shown by Messrs. J. & T. Johnson.

Chrysanthemum 'Doone Valley' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 22, Incurving, large-flowered, bronze. Flowers 6 inches diameter; florets medium length, broad, blunt, flat, rich reddish bronze, reverse gold. Raised by Mr. H. Shoesmith, V.M.H., and shown by Mr. Frank Rowe.

Chrysanthemum 'Figaro' A.M. September 30, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, bronze. Flowers 5½ inches diameter; florets medium length, broad, pointed, slightly quilled, rich reddish bronze. Raised and shown by Messrs. Rileys, Alfreton Nurseries, Woolley Moor, Derby.

Chrysanthemum 'Gaiety' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, pink. Flowers 4½ inches diameter; florets medium length, medium width, pointed, slightly quilled, Phlox Pink (H.C.C. 625/3), inner florets slightly flushed salmon. Raised and shown by Messrs. H. Woolman Ltd.

Chrysanthemum 'Golden Leader' A.M. August 12, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, large-flowered, light bronze. Flowers 6 inches diameter; florets medium

length, narrow, slightly pointed, slightly quilled, Chrome Yellow (H.C.C. 605), inner florets suffused bronze. Shown by Messrs. Colham Green Nurseries Ltd., Chapel Lane, Hillingdon, Middlesex.

Chrysanthemum 'Leanora' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, yellow. Flowers 5½ inches diameter, florets medium length, narrow, slightly pointed, Canary Yellow (H.C.C. 2). Raised and shown by Messrs. J. & T. Johnson.

Chrysanthemum 'Lorna Doone' A.M. September 19, 1958, as a variety for cutting for market. Section 21, Reflexed, medium-flowered, pink. Flowers 6 inches diameter; florets medium length, medium width, pointed, quilled, Fuchsine Pink (H.C.C. 627/2). Raised by Mr. H. Shoesmith, V.M.H., and shown by Mr. Frank Rowe.

Chrysanthemum 'Magic Moment' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, large-flowered, pink. Flowers 7 inches diameter; florets long, broad, blunt, flat, Magenta (H.C.C. 27/2). Raised and shown by Messrs. Rileys.

Chrysanthemum 'North Light' A.M. September 30, 1958, as a variety for show purposes. Section 21, Reflexed, large-flowered, white. Flowers 6½ inches diameter; florets medium length, broad, slightly pointed, flat, white. Raised and shown by Messrs. Rileys.

Chrysanthemum 'Patricia Hurst' A.M. September 2, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, pink. Flowers 6 inches diameter; florets long, medium width, pointed, slightly quilled, Persian Rose (H.C.C. 628/3), inner florets flushed salmon. Raised and shown by Messrs. J. & T. Johnson.

Chrysanthemum 'Pauline Shepherd' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, pink. Flowers 6 inches diameter; florets medium length, broad, slightly pointed, flat, Magenta (H.C.C. 27/2). Raised by Mr. H. Shoesmith, V.M.H., and shown by Mr. Frank Rowe.

Chrysanthemum 'Placator' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, large-flowered, white. Flowers 7 inches diameter; florets medium length, broad, blunt, flat, white. Raised and shown by Messrs. J. & T. Johnson.

Chrysanthemum 'Prestige' A.M. September 2, 1958, as a variety for show purposes and cutting for market. Section 22, Incurving, large-flowered, bronze. Flowers 6 inches diameter; florets long, broad, pointed, channelled, reddish bronze, reverse gold. Raised and shown by Messrs. Rileys.

Chrysanthemum 'Satellite' A.M. September 2, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, medium-flowered, light bronze. Flowers 5½ inches diameter; florets

medium length, narrow, slightly pointed, slightly quilled, a colour near Cadmium Orange (H.C.C. 8), inner florets lightly overlaid bronze. Raised and shown by Messrs. J. & T. Johnson.

Chrysanthemum 'Supremacy' A.M. September 2, 1958, as a variety for show purposes and cutting for market. Section 22, Incurving, large-flowered, white. Flowers 6 inches diameter; florets long, medium width, pointed, channelled, white. Raised and shown by Messrs. H. Shoesmith Ltd., Mayford Nurseries, Westfield, Woking, Surrey.

Chrysanthemum 'Tom Riley' A.M. August 12, 1958, as a variety for show purposes and cutting for market. Section 21, Reflexed, large-flowered, light bronze. Flowers 6½ inches diameter; florets medium length, broad, blunt, slightly quilled. Buttercup Yellow (H.C.C. 5/1), inner florets slightly deeper colour. Raised and shown by Messrs. Rileys.

Chrysanthemum 'Topper' A.M. September 19, 1958, as a variety for show purposes and cutting for market. Section 20, Incurved, medium-flowered, light bronze. Flowers 4 inches diameter; florets medium length, medium width, slightly pointed, channelled, light bronze. Raised and shown by Messrs. Rileys.

Chrysanthemum 'Westward Ho' A.M. September 16, 1958, as a variety for cutting for market. Section 21, Reflexed, medium-flowered, light bronze. Flowers 6 inches diameter; florets medium length, medium width, pointed, slightly quilled, a colour near Cadmium Orange (H.C.C. 8/1). Raised and shown by Mr. Frank Rowe.

FELLOWS WISHING TO OBTAIN PLANTS RARE IN CULTIVATION

IN response to the notice published on assistance in obtaining plants rare in cultivation, on page 4 of the January issue of the JOURNAL, the following requests are published. Will any fellow who is willing to offer one of these plants please communicate direct with the Fellow who is seeking it and not with the Editor.

Lithospernum rosmarinifolium	Miss E. M. Atkinson, Wellfield, 8 Davids, Pembs.
Boronias	K. M. Stotart, Writtle Priory, Writtle, Essex.
Camellia japonica 'Mme Cavallo' (Pink Form)	P. Rae Shepherd, Woodfield, Priory Close, Chislehurst, Kent.
Primula cortusioides	W. T. Pain, "The Lilacs", 43 Western Road, Romford, Essex.
Aster andersonii, A. purdomii, Sedum himalense, S. magallense, S. monregalense, S. roseum heterodontum, S. kirilowii	P. W. Barrett, Delvine, Beaminster, Dorset.

Dionaea muscipula (Venus Fly Trap)	R. Drummond Addy, 60 Gloucester Road, New Barnet, Barnet, Herts.
Jasminum angulare, *Paulownia fortunei*, *Buddleia crispa*, *Antigonon leptopus*, *Allamanda cathartica* var. *hendersonii*	Sir Ralph Newman, Bt., Blackpool, Dartmouth, South Devon.
Alluaudia (Succulent spp.), *Andansonia* (Succulent spp.), *Chortolirion* (Succulent spp.), *Adenium multiflorum*, *Dorstenia braunii*, *Idria columnaris*, *Talinum guadalupense*, *Welwitschia mirabilis*	D. C. Paterson, Oakdene, Park Avenue, Nuneaton, Warwicks.
Bergenia (variegated form), *Aspidistra* (variegated form)	Mrs. J. J. Emberton, Little Close, Linkside East, Hindhead, Surrey.

BOOK NOTES

"Azaleas." By Frederick Street. 278 pp. Illus. (Cassell.) 50s.

Any purchaser who had hesitated before spending fifty shillings on this book dealing only with azaleas—which as the author points out is after all just a part of the genus *Rhododendron*—will I am certain decide he was very wise to invest in it. Mr. Street is to be congratulated on starting out and finishing such a gigantic task and only he will ever know the hard work required to get together the wealth of information the book contains.

I feel that he has succeeded in weaving together two accounts in that he has provided for those who already possess some knowledge of azalea lore many facts about which they were previously hazy; for the others, and they will be in the majority, he has given a fascinating account telling us from where and how our present-day azaleas, be they deciduous or evergreen, have arrived in our gardens.

The book is divided into three main parts, entitled "The Azalea Story", "Selected Lists of Species and Varieties" and "Cultivation" and then sub-divided into thirty chapters. "The Azalea Story" will be read from beginning to end and the other sections used more as a reference work. Mr. Street relates incidents as he understands them in the lives of some of those who have carried out the breeding of azaleas and these will be enjoyed by those who knew the persons referred to and will no doubt be of real value for record purposes as time passes.

The book contains thirty-two coloured and fourteen monochrome illustrations, but all the coloured illustrations, particularly those taken in the open air, do not convey a good impression of the subjects selected. There are seven drawings illustrating operations dealing with cultivation, propagation and the technique of hybridizing.

F. P. KNIGHT

"Dwarf Pyramid Fruit Culture." By D. Macer Wright. Demy 8vo. 142 pp. Illus. (Faber.) 21s.

That a whole book such as *Dwarf Pyramid Fruit Culture* can be devoted to one form of tree is indicative of the especial care necessary to achieve success in fruit-growing. Mr. Macer Wright relates his own experiences and underlines the many pitfalls awaiting the unwary, particularly those not appreciating what a long-term business fruit-growing is. In this connection his advice on personal selection of trees, the use of official services available and the chapter on costings are commendable.

Dwarf pyramids are an intensive way of producing apples and pears and therefore need constant and timely attention in matters of manuring, pruning and spraying. These are dealt with in an interesting and easy manner, although the pests and diseases listed are only a fraction of the troubles that can occur. This is to be expected in a small and general book. Lack of illustrations of pyramids themselves is perhaps the book's weakest point; too many are of pests with no magnification stated.

There are other minor criticisms—such as the lack of sub-headings—but the author has obviously striven to portray the subject in its true light so that his successors can avoid at least some of the attendant problems and disappointments.

E. G. GILBERT

"A textbook of Gardening for Schools and Students." By Jack Hardy and S. Foxman. Cr. 8vo. 513 pp. Illus. (Allman.) 19s. 6d.

The seventh edition of this valuable book, published in 1939, has now been revised by the authors. Much progress has been made in horticultural research during the last twenty years, and in his helpful Foreword Mr. Hardy enumerates some of the most significant changes together with suggestions of specialist literature for those who wish to go further than he considers advisable in this book. The authors have indeed produced a most comprehensive work which covers every aspect of gardening particularly in relation to the school garden. To all teachers of rural science and to those who have to plan and actually make gardens for educational purposes, this book cannot fail to be of real value.

Beginning with surveying and levelling the site, the many chapters lead one through the whole process of making school gardens, from soil cultivations to the planning and planting of the various types of garden, including the Herb Garden and Playground Garden. Even the School Garden Library is not forgotten. In the chapters dealing with the development of seed and the growth of plants, many useful experiments are clearly explained for the benefit of those who teach and those who learn. There are many excellent illustrations and photographs throughout the book, but in the chapter concerned with the Fruit Garden, I would like to have seen more detailed diagrams of the development of young fruit trees during the first few years. The development of tree fruits from bud or graft is such an interesting study, as is also the development of soft fruit bushes from hard wood cuttings, and forms a valuable foundation for the study of pruning.

There is a great need for inspiration and guidance in the arrangement of a school garden as both an interesting and educational unit, and I feel that this excellent book is of enormous value and will continue to play an important part in raising the standard of instruction for the young generation. I strongly recommend it to all young students.

BEATRIX HAVERGAL, N.D.H.

"Proceedings of the Second World Orchid Conference, Sept. 19–23, 1957, Honolulu, Hawaii." Edited by Gordon W. Dillon. Obtainable from the American Orchid Society. $10.

This is a book of 250 closely printed pages, in which are given in full all the fifty-six individual contributions to the Conference, as well as reports on the formal sessions. The speakers came from at least a dozen different countries, and their subject-matter covered almost every aspect of present-day interest in orchids: techniques of cultivation and germination, hybridization and its relations with cytology and genetics, taxonomy and nomenclature, phyto-geography, virus diseases, the commercial aspects of orchid growing, problems of judging and orchids in use. The Conference was held in Hawaii, where a large orchid-growing industry has been built up in the past twenty years, largely based on genera and species little grown or bred from in temperate regions of the world. This new orchid industry in Hawaii is symbolic of a great growth of interest in orchids in many countries, and the Conference (attended by nearly 1,000 persons from at least twenty countries) was a remarkable demonstration of the fact that orchid growers in various parts of the world are interdependent and must take some thought to plan their necessary co-operation. One result of the Conference was the appointment of an international Orchid Commission; another was an agreement to hold a third World Conference in the year 1960 (it is planned to hold this in London). Every orchid grower would find something of interest in this book, which provides an impressive survey of the range of thought and of investigation being devoted today to orchids.

R. E. HOLTTUM

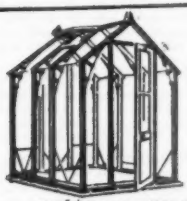
ORDERS FOR BOOKS

The Society does not sell any publications other than its own. Orders for books reviewed should therefore be sent direct to the booksellers and not to the offices of the Society.

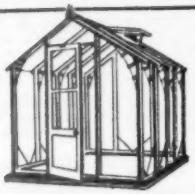
The contents of this volume are copyright. For permission to reproduce any of the articles application should be made to the Council.

OAKWORTH

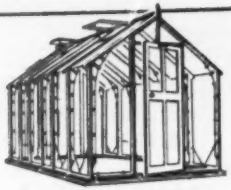
SEASONED OAK GREENHOUSES



"ZZ" Series. All 5' 2" wide, from £20.10.0.



"T" Series. All 6' 0" wide, from £22.10.0.



"K" Series. All 7' 0" wide, from £34.10.0.

5 YEAR GUARANTEE

- ★ SCIENTIFICALLY CONSTRUCTED TO GROW MORE AND LAST LONGER
- ★ TREMENDOUS STRENGTH
- ★ MAXIMUM LIGHT
- ★ WILL NOT WARP OR ROT
- ★ ALL MODELS EXTENDIBLE

"D" Series. All 8' 3" wide, from £37.5.0.

"DX" Series. All 10' 5" wide, from £50.10.0.

Complete prefabricated units. Delivered free to your door. Erected on delivery. Deferred Terms. Full details of prices and 50 sizes available in:

FREE CATALOGUE

from

OAKWORTH GREENHOUSES

(Dept. J.R.H), WELLINGTON, SALOP.

Lean-to's. Various widths from £20.5.6.

THE NATION'S GREENHOUSE SPECIALISTS

A Reminder

AFRICAN VIOLETS

(SAINT PAULIAS)

The period when potted plants in bud and bloom are available is **MAY TO SEPTEMBER,** and our Gold Medal Collection of named varieties has again been augmented with some thrilling new varieties from the U.S.A.

Assuredly

THE FINEST COLOURS
THE BEST GROWERS
THE MOST FLORIFEROUS

and the

CLEANEST STOCK

are those offered by

W. C. WICKS LTD.

AFRICAN VIOLET SPECIALISTS

NOTTINGHAM

Descriptive List of over 50 varieties. Natural colour plate and cultural instructions. Price 6d., plus 3d. postage.

NEW BIENNIAL AND PERENNIAL FLOWERS

THE POMPONETTE DAISIES. These miniature Double Daisies or Bellis carry a profusion of small, double flowers each one made up of a tight mass of firmly quilled petals. Neat and compact habit. Height 6 ins.

Pomponette Red. Bright crimson-scarlet. No. 882. Per packet 1/-

Pomponette Rose Shades. Attractive shades of rose and pink. No. 883. Per packet 1/-

MYOSOTIS BLUE BOUQUET. The deepest and bluest of all Forget-me-Nots. Primarily a variety for cutting but useful also for bedding, especially with tall-growing bulbs. To provide cut flowers in winter and spring pot up in autumn and keep in a cold house.
No. 973. Height 15 ins. Per packet 1/-

MYOSOTIS MARINA. The best bright blue Forget-me-Not for spring bedding. The plants grow 6-8 ins. high and are extremely neat and uniform.
No. 1000. Per packet 1/-

DIANTHUS BLUE HAZE. A first-class bedding plant, rather like a blue Sweet William, with long-lasting and weather-resistant flowers. Blue Haze varies a little in height and colour but the general effect is of soft lavender-blue.
No. 944. Height 12-18 ins. Per packet 1/-

Please add 3d. extra for postage

***FREE!** Ask for a copy of our 92-page colour-illustrated Garden Seed Book for details of many other new and interesting flower seeds.*

SAMUEL DOBIE & SON LIMITED
(DEPT. 66)
11 GROSVENOR STREET, CHESTER

WALTER C. SLOCOCK, Ltd.

FOR OVER 160 YEARS

RHODODENDRON SPECIALISTS

AND PRODUCERS OF FIRST-QUALITY

ORNAMENTAL TREES AND SHRUBS, FRUITS, ROSES, Etc.

Please write for copies of our

CATALOGUES

POST FREE

"RHODOS and AZALEAS" and/or "TREES and SHRUBS"

GOLDSWORTH NURSERY
WOKING ∴ SURREY

The very finest

FRUIT TREES & BUSHES

come from

BLACKMOOR ESTATE LTD.

RENOWNED FOR QUALITY & RELIABILITY

The very finest **ROOTSTOCK**

Trees now obtainable on the newest Malling-Merton rootstocks. Also the tried and tested E.M. VII and IX.

The very finest **XMAS GIFTS**

GIFT VOUCHERS issued for any sum from £1 upwards. Voucher and catalogue sent to your instructions. The ideal gift for the garden lover . . . useful for business presents too.

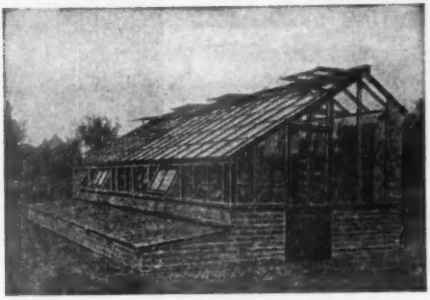
Write for **FREE CATALOGUE**

Containing much useful information, and pollination tables.

BLACKMOOR ESTATE LTD.
FRUIT NURSERY DEPT. J.R.H.
LISS (Tel. Blackmoor (Hants) 276/7) HANTS

ALL-CEDAR GREENHOUSES

No Painting Low Upkeep Costs



Write for free illustrated catalogue of All-Cedar Greenhouses for all purposes and Summer Houses

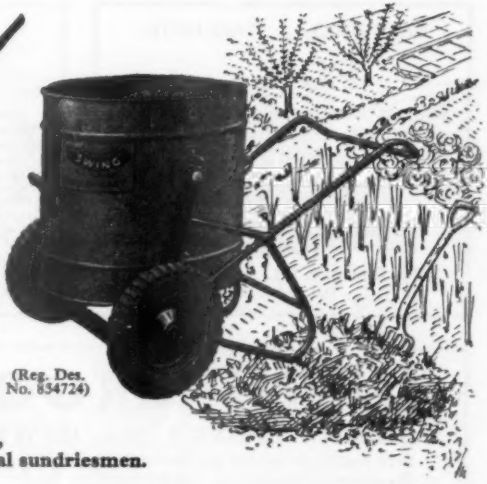
C. H. WHITEHOUSE
LIMITED

Phone: FRANT 247 **Buckhurst Works, FRANT, Sussex**

Easy does it!

The 'Swing' all-purpose WATER CART provides abundant capacity for water, manure, etc., without waste. Light, easy to handle—but very sturdily constructed. Tips easily. Heavily Galvanized Container, Welded Tubular Steel Frame, Solid or Pneumatic Rubber Tyred or Unbreakable All-Steel Wheels. Countless uses—for carrying liquids and solids.

6-sizes—15 to 50 gallons.



(Reg. Des. No. 854724)

Stocked by Geo. Munro, Carters, Suttons and all good horticultural sundriesmen.

alfred allen & SON LTD

LOWER GORNAL, Nr. DUDLEY

London Office: 23 LAWRENCE LANE, E.C.2 TEL : MONARCH 2978

A4388

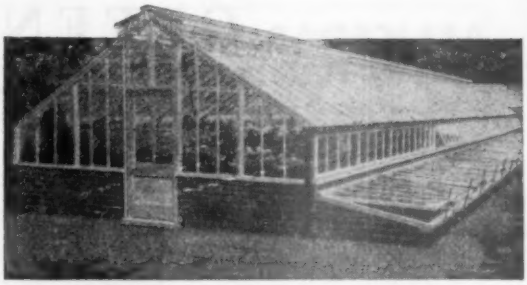
Messenger

HORTICULTURAL BUILDERS & HEATING ENGINEERS

Designs and Estimates submitted at your request or we will build to your specification.

Write for Catalogue

MESSENGER & CO. LTD.
Cumberland Road,
LOUGHBOROUGH. Tel.: 2691



London Office: 46 Victoria Street, S.W.1. Tel. Abbey 2040

FLORISTRY

A rewarding career or a profitable hobby. Our specialised home study Course in Floristry and Flower Arrangement covers every detail, and all equipment is provided.

Please write for our Prospectus — sent free and post free

THE RIVIERA SCHOOL OF FLORISTRY (H)
PENRYN, CORNWALL

Godfreys
for garden machinery

The Mechanized Garden Centre
110 Marylebone Lane, W 1 (Wel. 6842)
and Brenchley, Kent

GARDENERS.....TAKE NOTE!

FOIL REGD.

prevents bites from all insects in gardens, woods, fields. It is pleasant, harmless to skin and eyes, and it is efficient.

1 bottle 2/6d. 3 for 6/6d.
(inclusive of postage and packing)

From: **R. C. GREEN, LTD.**
Chemists
187a Brompton Rd., London, S.W.3
Tel.: KEN 2069

'HART'
Certified
GRASS SEED
Treated against birds and pests
Cash with order, carriage paid, bags free
"Standard" Mixture of Sheep's Hard and Red Fescue Browntop, R.S. Meadow Grass, S.23, N.Z. Devon Eaver and S.S. Ryegrass. 1-14 lb. 3/- per lb.; 15 lb. and upwards 2/9 per lb. (cwt. rate).
Free on request: (*a*) Grass Seed Mixture Analysis Chart; (*b*) Bulletin of Fertilisers and Horticultural Sundries.
Pre-seeding Base Fertilizer (2 oz. to the sq. yd.) 1/- per lb., minimum 14 lb. and upwards.
Supplied by:—
MAXWELL M. HART (LONDON) LTD
Trial Grounds, Winnersh, Wokingham, Berks.
Phone: Wokingham 1121

JUSTIN BROOKE LTD.

WICKHAMBROOK, Nr. NEWMARKET, SUFFOLK

We invite you to visit our nurseries and fruiting orchards at any time, including Sundays—preferably by appointment.

We have a large acreage of nursery stock, including Roses, Peaches, Nectarines, Apricots, Cherries, Apples, Pears, Plums and Figs.

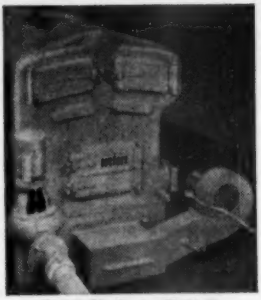
In our fruiting orchards you can see the results obtained by planting similar stocks of all these fruits; and you can see the results at various stages of growth.

PEACHES ON PEACH STOCK

Telephones:
In office hours—Wickhambrook **200** Out of office hours—Wickhambrook **304**

NEW!
-THE FASTEST of all electric HEDGE-CUTTING TOOLS!
TELES
TIGER
HEDGE-CUTTER
—FASTEST, because its cutting action consists of a series of high-speed cutter blades linked together in a continuous chain which is electrically driven around a static guide bar . . . it is suitable for cutting hedges, bushes and shrubs and cuts 2 to 3-year growth cleanly without bruising . . . it has enormous advantages over ordinary reciprocating types of trimmer.
110V model costs £17.0.0. ● Fully guaranteed for twelve months
200-250V model costs £18.0.0.
Full particulars from: TELES SMITH LTD.,
8 SOUTH WHARF, PADDINGTON, LONDON, W.2 AMBassador 2856
One of the Acrow Group of Companies

LIQUINURE
LIQUID MANURE
LIQUINURE
LIQUID MANURE
A perfectly balanced Plant Food for bigger and better crops. Three types—General, Tomato Special and Flower Special. Sold everywhere in 2/- and 3/9 bottles.
New 1-gall. Polythene Container 24/-
Automatic Diluter 24/-
Also half gall. 15/- carr. paid.
LIQUINURE SALES
BOREHAM WOOD, Herts.



MIRRLEES FORCED DRAUGHT BURNERS

give you all the advantages of AUTOMATIC TEMPERATURE CONTROL while burning the CHEAPER GRADES OF FUEL. Cost is less than £100 for Burners suitable for Boilers rated up to 500,000 B.T.U's per hour. **LARGER SIZES ALSO AVAILABLE.**

Please write for Descriptive Leaflet

MIRRLEES WATSON Co. Ltd.
Kennerley Works · Buxton Road
STOCKPORT *'Phone STEpping Hill 3827*

By Appointment Nurserymen & Seedsmen

to H.M. Queen Elizabeth The Queen Mother

We publish annually the following Catalogues

TREES & SHRUBS

(price 1/6)

Including Rhododendrons, Conifers, Climbers and Bamboos. Growers commercially of the greatest number of species and varieties hardy in the temperate regions.

Hedging Plants. Hardy Perennial, Biennial, Alpine and Aquatic Plants (price 1/–). Bulbs. Rose Trees, Including species and old-fashioned types, and Fruit Trees.

Please send us your request for those in which you may be interested.

(Request for Tree and Shrub Catalogue must be accompanied by remittance for 1/6 and for Perennial Catalogue by 1/–)

Any not at present available will be sent when published.

HILLIER & SONS

WINCHESTER

Awarded Gold Medal at every Chelsea Show since the War

DOBBIE'S

Dahlias

OF DISTINCTION

Our New Introductions for 1959

We have pleasure in introducing another selection of new varieties which we consider will become popular.

EILEEN McBRIDE (Small Decorative)
Lavender pink with creamy base; 3½ ft.

PINK GLEAM (Small Decorative)
A lovely rich pink; 4 ft.

QUEENIE DONELLA (Medium Cactus)
Suffusion of rose with mauve shadings; 3½ ft.

SHELTY (Small Decorative)
Glistening white throughout; 3½ ft.

SUNBRIGHT (Medium Cactus)
Bright orange, with a cream base to each petal; 3½ ft.

VISCOUNTESS MELGUND (Medium Cactus)
Lively pink with apricot base; 3½ ft.

All the above are free flowering, with cane-like stems.

POT-GROWN PLANTS, ready May-June, 10/6 each

Collection of six varieties one plant of each 60/-
packed and post free

Our full collection of Dahlias is published in our Spring Catalogue — a copy of which can be had on request.

DOBBIE & CO LTD

EDINBURGH 7

GENTIANS

Acaulis 2/–, acaulis dinarica 2/6, asclepiadea 2/6, asclepiadea alba 3/–, Bernardii 3/6, Caroli 3/–, Devonhall 5/–, Devonhall Seedlings 3/6, Farreri 3/–, Glendevon 5/–, hexa-Farreri 2/6, Inverleith 5/–, Inverleith Seedlings 3/6, Macaulayi 2/6, ornata hybrids 2/6, saxosa 2/6, septemfida 2/–, sino-ornata 2/–, sino-ornata alba 3/6, sino-ornata Brin (Trotters form) 2/6, sino-ornata praecox 2/6, sinora 3/–, Stevenagensis 3/6, Veitchiorum 3/6, Veitchiorum hybrids 2/6, verna angulosa 2/6. All ex. pots. Carriage paid for C.W.O. 20/– and over. Under, add 2/–.

MARYFIELD NURSERIES

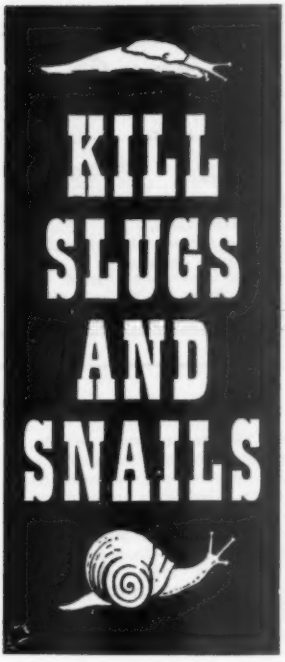
Leslie, Fife

GARDENING WITH ELECTRICITY

By A. W. Gray

Illustrated. Price 1s., post 4d.

Obtainable from: THE SECRETARY
THE ROYAL HORTICULTURAL SOCIETY
VINCENT SQUARE
LONDON, S.W.1



SLUGIT PELLETS

Simply scatter the pellets among the plants. They will attract Slugs and Snails away from the crops with fatal results for the pests.

1/6 2/6 4/6 7/6

SLUGIT LIQUID

Just dilute with water and apply to both soil and plants. The treated area becomes lethal to Slugs and Snails.

2/6 3/9 9/- 17/6

Other Murphy Aids to Better Gardening include

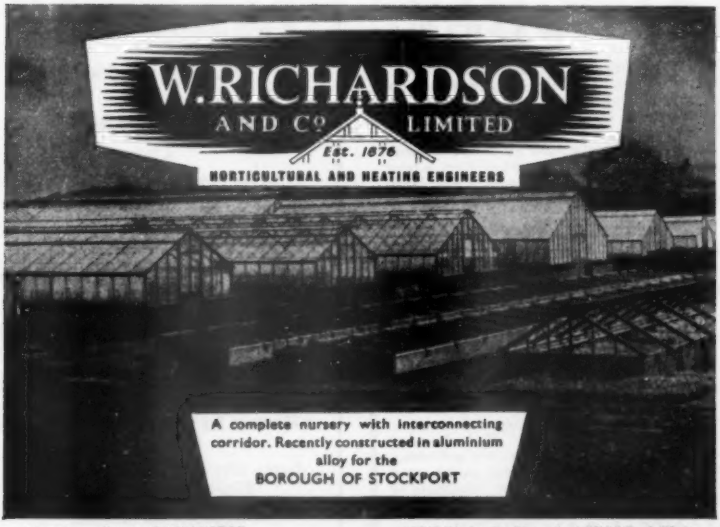
LINDEX GARDEN SPRAY
Kills a wide range of insect pests. 3/3 5/6 13/- 23/6

LIQUID MALATHION
A very efficient general-purpose insecticide. 5/6 10/- 21/6

ORTHOCIDE GARDEN FUNGICIDE
Controls Rose Black Spot, Apple Scab, etc. 3/- 9/6 27/6

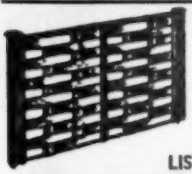
KARATHANE MILDEW FUNGICIDE
Controls Powdery Mildew on many plants. 3/- 9/6 27/6

The Murphy Chemical Co. Ltd., Wheathampstead, Herts.


W. RICHARDSON
AND Co LIMITED
Est. 1876
HORTICULTURAL AND HEATING ENGINEERS
A complete nursery with interconnecting corridor. Recently constructed in aluminium alloy for the
BOROUGH OF STOCKPORT

Neasham Road, DARLINGTON **117 Victoria Street, LONDON, S.W.1**

RURAL INTERLACE
The QUALITY FENCING



Only best-seasoned timber used.
This fencing
WILL LAST
Also Wattle, Osier, Hurdles, Chestnut Fencing, Gates, Arches, etc.
LISTS FREE from:

DAVIDS RURAL INDUSTRIES LTD
Dept. (R),
15 MORETON ST.,
LONDON, S.W.1
(Tate Gallery 8332)

VALE for VALUE

GARDEN SHEDS
WANEY EDGE from £8 14s. 6d.
SOFTWOOD P/E from £9 7s. 6d.
CEDAR from £10 10s.

GARAGES
WANEY EDGE from £23 15s.
CEDAR from £29 15s.
SHIPLAP from £31 5s.
ASBESTOS from £29 14s.
GREENHOUSES
from £20 10s.
SUN LOUNGES from £248s.
Carr. paid England & Wales

SEND FOR FREE LISTS—FREE PLANS
New easier terms from 5% Deposit
All types of Fencing, Ladders, Gates, etc.
VALE COUNTRY PRODUCTS
(Dept. R), Barkham Road, Wokingham, Berks.

RHODODENDRONS
SHRUB ROSES
CAMELLIAS, AZALEAS
FLOWERING SHRUBS
GROUND COVER

PLEASE ASK FOR LISTS

SUNNINGDALE NURSERIES
The most beautiful nursery in the country
WINDLESHAM, SURREY Tel.: Ascot 96

Belgrave Hotel, Torquay

welcomes you for the summer months. Situated in the centre of the sea front, with our own sub-tropical gardens and sun lounge, filled with house plants and tropical flowers now. Seventy really first-class rooms, some with private bath and toilet, on two floors only, with elevator. Perfect food, with quiet willing service. Telephone 4818, or may we send you a brochure

G. H. Gillin, F.R.H.S.

Now is the time to plant

WATER LILIES
AND OTHER AQUATICS

Our illustrated booklet '*The Water Garden*' describes them in detail — and how to grow them. It tells you when, where, and how to plant, how to keep the water clear, how to make a miniature water garden, and includes a unique depth and colour guide to the hardy water lilies. A new, enlarged edition is now available, full of practical advice and helpful diagrams. *Send 1/6 for a copy today to*

Stewarts Nurseries
FERNDOWN, DORSET Est. 1742

KNIGHT'S NURSERIES LTD.
HAILSHAM, SUSSEX
Telephone 454

For Alpines
AND
Herbaceous Plants

Send for our catalogue

ORCHIDS

Buy direct from actual producers! Six flowering size Cymbidiums, different colours, for £6; 2 Cypripedium Hybrids, 2 Odontoglossums, 1 Coelogyne, 1 Dendrobium for £5. 10. 0; flowering size Cattleyas 25/- each; thousands of unflowered seedlings and hundreds of curious orchids, send for lists. Our illustrated Booklet "Simplicity of Orchid Growing" will be sent free on application.

MANSELL & HATCHER LTD
Dept. R.H., Craggwood Nurseries, Rawdon, Leeds
(Only 5 miles from Bradford)

HART HALL NURSERIES LIMITED
(A. D. HINSHELWOOD)

12 Rockery and Alpine Plants.	23/-
12 Heathers for year round bloom	27/-
6 Heathers for winter flowering	13/6

Carriage 2/6

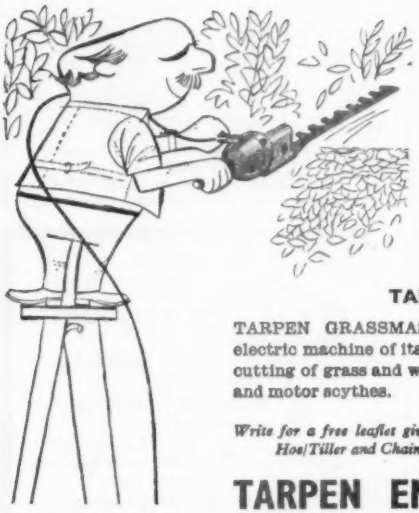
Hardy Alpines, Primulas, Meconopses, Heathers, Dwarf Conifers

Catalogue free on request

HART HALL NURSERIES LIMITED
HYDE LANE, HEMEL HEMPSTEAD, HERTS

Life is much easier with a

Tarpen



Back-break and tedious time-wasting are things of the past with the Tarpen Electric Hedge Cutter. Weighing only 6 lb., its well guarded reciprocating blades give the clean secateur cut approved by professional gardeners.

Price: from £17.10s.

TARPEN GRASSMASTER

TARPEN GRASSMASTER—The most powerful and efficient electric machine of its kind on the market. It gives you fast, close cutting of grass and weed growth in places inaccessible to mowers and motor scythes.

Price: from £13.10s.

Write for a free leaflet giving all the details of these machines and the Tarpen Hoe/Tiller and Chain Saws, etc., tools that are really built for the job.

TARPEN ENGINEERING CO. LTD

26 Ixworth House, Ixworth Place, London, S.W.3. **Tel.: KENsington 3491 (7 lines)**

SANGRAL
CHRYSANTHEMUM
SPECIAL

Dilution, 1 dessertspoon of Sangral makes 2 gallons of liquid manure. One gallon feeds six to eight plants. FEED ONCE WEEKLY. Sangral is absolutely safe and can be applied over the foliage.

IDEAL FOR DAHLIA and GLADIOLI too!

SANGRAL
TOMATO
SPECIAL

The proved balanced feed for

RING CULTURE

Add 1 dessertspoon of Sangral to 1 gallon of water. One gallon feeds three to four plants. Feed once weekly for splendid crops of superb flavour.

Bottles **2/3**, **3/9**; Half-gallon **15/–**; One Gallon **27/–**

SOLD BY
SEEDSMEN, IRONMONGERS, DEPT. STORES and WOOLWORTH STORES EVERYWHERE

POTENTILLAS

Summer season shrubs. These small plants rarely exceed four feet and flower throughout the summer. Fully hardy.

ARBUSCULA. Deep yellow
FARRERS WHITE. Small white flowered
KATHERINE DYKES. Canary yellow
MANDSHURICA. Prostrate; white
PARVIFOLIA. Finely cut leaves; flowers gold

Available for autumn planting.

Burkwood & Skipwith Ltd.
Park Road Nurseries, Kingston-on-Thames
Telephone: KIN 0296

BAMBOO CANES

All per 100	A. Thin s. d.	B. Med. s. d.	C. Stout s. d.	D. Ex. Stout s. d.
12 in.	5 0	5 6	6 6	7 6
18 in.	5 6	6 6	7 6	10 0
2 ft.	6 6	7 6	10 0	12 6
2½ ft.	7 6	10 0	12 6	17 6
3 ft.	12 6	15 0	20 0	25 0
4 ft.	17 6	20 0	30 0	35 0
5 ft.	35 0	40 0	45 0	50 0
6 ft.	40 0	45 0	50 0	60 0
7 ft.	50 0	55 0	60 0	70 0
8 ft.	55 0	60 0	70 0	80 0
10 ft.	60 0	70 0	80 0	90 0

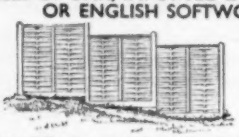
Orders over £2 carriage paid. Under £2 add 2/6 for freight.

C.W.O. Less than 100 supplied at pro-rata rates.

THE BRITISH BAMBOO CANE CO. LTD.
52 LANIVET, BODMIN, CORNWALL

FENCING AND GATES

PANELS OF OAK, IMPORTED DEAL, OR ENGLISH SOFTWOOD



All types of Fencing and Gates supplied fixed, including Hazel and Osier Hurdles. Fruit Cages, Tennis Court Surrounds, Teak Furniture, etc.

GERALD GILMER LTD.
TEL. 1640/1 **LEWES** EST. 1922
And at BISHOP'S WALTHAM. Tel.: 271

YOUR PLANTS NEED SEDGE PEAT PRODUCTS

ECLIPSE

★ **MULCHING**—ask for details of "no weeding mulch"

★ **RHODODENDRONS**—Special product available

Write for details and free booklet ★ **FEEDING**—use VITA-MURE double-action plant food

THE ECLIPSE PEAT COMPANY LTD.
ASHCOTT. Box No 12. BRIDGWATER, Somerset

save your fish from Herons...

. . . with our underwater 6" mesh nylon preventative NETTING. An entirely new, tested method of preserving your fish in ornamental ponds. Made to required size. Price: 4/6 per sq. yd., carr. paid. (Dyed green or other colour, 6d. per sq. yd. extra)

★ *Write for descriptive leaflet to:*
MIDACRES LTD., 24, HYVER HILL, LONDON, N.W.7

Conservatories Garden Dens...

Garages, greenhouses, loose-boxes and garden buildings of all descriptions.
Hire purchase terms available.
Please send for illustrated catalogue.

ALPHA WOODCRAFT LTD.,
Dept. 24, Star Road, Hillingdon Heath, Uxbridge, Middx. *Tel. HAYes 0657*

Allwood's Cut Carnations

at substantially
REDUCED PRICES
during July

£1. 1. 0	boxes for	15/-
£2. 2. 0	,,	,, 30/-
£3. 3. 0	,,	,, 42/6
£4. 4. 0	,,	,, 57/6
£5. 5. 0	,,	,, 67/6

The Ideal Gift for all occasions.

One quality only, the best!
Write for Catalogue

Allwood Bros
(Cut Flower Dept.)
HAYWARDS HEATH, SUSSEX (*Wivelsfield 232*)

R.H.S. PAMPHLET

HOUSE PLANTS

By T. Rochford

This pamphlet describes the care and cultivation of many of the interesting plants suitable for growing in the house.

Price 1*s.* 3*d.* By post 1*s.* 7*d.*

AIN'T IT GRAND TO BE BLOOMING WELL!

says BOB GREEN, our gardening expert

What a joy it is to see your plants throwing out their chests in the sunshine (or rain) this month, bursting with health and vigour! Aren't you glad now that you used that wonderful pair—Jeypeat Compound and Jeyes' Fluid? Did you ever in your life have crops so clean, so free from pests and disease? Keep it up, lads—little and often, that's the rule of Jeypeat and Jeyes' Fluid!

STOP ROOT PESTS

Carrot Fly, Onion Fly, etc. These pests lay their eggs in the soil and the grubs feed on the roots. To protect your crops, sprinkle Jeypeat Compound lightly along the rows once a fortnight. Always apply Jeypeat after thinning carrots. Jeypeat also affords protection against Cabbage Root Fly, Flea Beetle, Gall Fly, etc.

Death to Slugs and Snails

Slugs and snails are always about. Jeypeat Compound kills them on contact. Protection from these voracious pests consists in sprinkling Jeypeat once a fortnight along the rows or around individual plants.

STOP FOLIAGE PESTS

Keep Green Fly, Black Fly, etc. away by spraying foliage once a week with ONE TEASPOON of Jeyes' Fluid per gallon of water. This solution, applied before infestation occurs, is such an effective deterrent that these pests avoid plants so protected. Roses especially benefit from this treatment, which also helps to prevent the spread of mildew and other fungus diseases.

Cabbage Butterfly, etc.

The above solution is also a very effective deterrent against caterpillar producing Cabbage Butterfly and Cabbage Aphis. To protect your Brassicas from attack spray the foliage regularly, paying special attention to the undersides of the leaves.

JEYPEAT

COMPOUND

—the amazing 3 in 1 soil treatment

Jeypeat contains *of Jeyes' sulpo* peat accurately and correctly impregnated with Jeyes' Fluid. In this form the Jeyes' Fluid content stays active much longer than when used in solution—a big advantage for many purposes.

- Jeypeat Compound cleanses soil of fungus diseases and wintering pests
- Jeypeat Compound protects growing plants from root pests. Slugs are killed on contact
- Jeypeat Compound enriches soil with the humus essential to fertility and promotes healthier growth

JEYES' FLUID

is a really powerful sterilising preparation that's *safe in use*. Its many valuable uses include sterilising potting soils, deep-sterilising badly diseased outdoor patches—deterring foliage pests, winter spraying, and the annual washdown of greenhouses and frames.

The above are only a few of the many strikingly successful applications of Jeypeat Compound and Jeyes' Fluid for FLOWERS, VEGETABLES, FRUIT, LAWNS, GREENHOUSES, etc.

A BOOK IN A MILLION!

We're Fred Loads' latest book, "All Grows Well"—a wonderfully helpful guide to successful gardening. Clear, practical, up-to-date, full of good and original ideas. 164 pages—only 4/6d. post free.

FREE!

Directions for mixing are on containers. For fuller information write now (block letters please) for free leaflet "Jeyes' in the Garden"—packed with new and better ways of getting the best out of your garden right through the year.

JEYPEAT

COMPOUND

THE REVOLUTIONARY PARTNER TO

JEYES' FLUID

The best disinfectant on earth

JEYPEAT COMPOUND	JEYES' FLUID
Trial Carton 1/3 Pygmee Size 4/6	Sample—Post 2/3 Quart 5/-
Medium Size 9/- Large Size 12/-	Std. 15/- Trial Bottles 1/3

from the dealer who supplies your gardening requirements

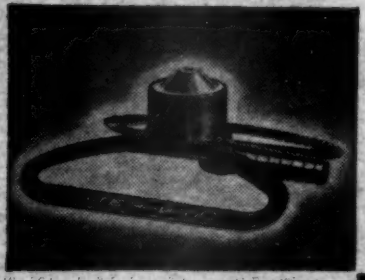
JEYES' (DEPT. 287), RIVER ROAD, BARKING, ESSEX

SIMPLER, EASIER WATERING WITH WATERMATIC SPRINKLERS

These two popular-priced Watermatic Sprinklers—the Lawn Sprinkler and the Border Sprinkler—combine simplicity of design with maximum efficiency.

Both models send out a spray that is *evenly distributed over a large area*. The spray itself is exceptionally fine and therefore falls gently—no 'washing out' of fertilisers or dressings.

There are no moving parts to wear or cause leaks. The non-ferrous castings and components rule out damage by rust.

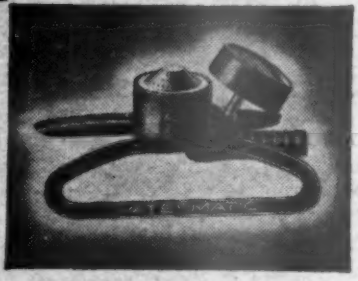


WATERMATIC LAWN SPRINKLER

Designed to cover large all-round areas, the Watermatic Lawn Sprinkler sprays a fine drenching 'rain' over approximately 400 sq. ft. (subject to mains pressure). Lawn skids allow the sprinkler to be moved quickly, easily over the turf. Price 7/-.

WATERMATIC BORDER SPRINKLER

Specially made to fulfil a long-felt need, the Watermatic Border Sprinkler sprays in one direction only. An easy-to-operate control cock adjusts the fine spray to cover oblong areas ranging from 40 ft. by 9 ft. to 6 ft. by 2 ft. Price 10/6.



TOMATABS FOR BETTER TOMATOES

Individual plant feeding with Tomatabs—the special tomato fertiliser in tablet form—greatly improves the tomato crop. The plants develop into sturdy, short-jointed stock . . . come into abundant fruit much earlier . . . yield rich, juicy tomatoes of excellent colour. Price 2/3 and 9/-.

PLANTOIDS LIMITED, BROMLEY, KENT

Printed by Spottiswoode, Ballantyne & Co. Ltd., London and Colchester